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CULTURAL RESOURCE PLAN — McKINLEY MINE

THE PITTSBURG & MIDWAY COAL MINING COMPANY

P&M

Prepared By

Fred Plog, PhD.
Cultural Resource Management Program
New Mexico State University

Kenneth C. Tapman, Esq.
Continuum Corporation

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AMERICAN
MINING CONGRESS
ABSTRACT OF
CONVENTION PAPER

SUITE 300 1920 N STREET NW WASHINGTON DC 20036 202/861·2800 FOUNDED 1897
J. ALLEN OVERTON, JR., PRESIDENT

IMPACTS OF ACID RAIN LEGISLATION ON THE COAL INDUSTRY

Paper to be presented at the
1983 American Mining Congress
Coal Convention, Surface Mining/
Environmental Concerns Session,
Monday afternoon, May 16

John M. Wootten, Director
Environmental Services
Peabody Coal Company
St. Louis MO

Robin H. Skitt
Senior Planning Analyst
Peabody Holding Company
St. Louis MO
and
Michael A. Fletcher
Planning Analyst
Peabody Holding Company
Washington DC

The coal industry has been impacted in the past by air quality related legislation. This impact has manifested itself in the form of coal displacement and resulting mining job losses. Proposed acid rain legislation will extend and intensify these impacts.

The acid precursor control provisions adopted by the Senate Environment and Public Works Committee on July 22, 1982 and recently reintroduced by Senator Stafford as S.768, would, among other things, require reductions in annual sulfur dioxide emissions by eight million tons below actual 1980 levels in a 31 state Acid Deposition Impact Region (ADIR).

Since these provisions were passed by the Senate committee, Peabody Coal Co. has continued to analyze these acid precursor control provisions and their impact on consumer costs, high sulfur coal production and mining related employment. The company estimated that the impacts of this legislation would increase electrical generation costs to utilities by $7.0 billion annually. This cost must ultimately be paid by the electrical consumer.

The effect of the legislation on coal production indicates that there will be a major displacement of production within the ADIR. Northern Appalachia, southern Appalachia and the Midwest would lose substantial coal production. According to the Peabody estimate, 170 million tons of coal production would be displaced in 1995 from one state to another or distant areas within states.

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CONVENTION PAPER

SUITE 300 1920 N STREET NW WASHINGTON DC 20036 202/861·2800
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FOUNDED 1897

THE HIGH DENSITY SLUDGE PROCESS -- AN IMPROVED TECHNOLOGY TO TREAT COAL MINE DRAINAGE

Paper to be presented at the
1983 American Mining Congress
Coal Convention, Surface Mining --
Environmental Concerns Session,
Monday afternoon, May 16

Stewart T. Herman
Engineer, Chemical and Environmental Process
Research Department
Bethlehem Steel Corporation
Bethlehem PA
and
Michael C. Korb
General Superintendent
Panther Valley Division
Bethlehem Mines Corporation
Tamaqua PA

The Panther Valley Division of Bethlehem Mines Corp. has installed a new facility that treats 11.5 million gal. per day of acid mine drainage. It meets discharge criteria of 3.5 ppm total iron, 2.0 ppm total manganese and 35 ppm total suspended solids.

This new facility utilizes modifications to the Bethlehem developed lime neutralization -- high density sludge process which make it possible to meet the discharge criteria while (1) producing a dense sludge containing 25 percent solids, (2) achieving manganese removal at pH 9.0, and (3) greatly reducing calcium carbonate scaling. Details of pilot plant and full-scale plant design and operation are presented in the paper.

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Cultural Resource Management Program
New Mexico State University

Kenneth C. Tapman, Esq.
Continuum Corporation

United States Department of the Interior
OFFICE OF SURFACE MINING
Reclamation and Enforcement
WASHINGTON, D.C. 20240

SEP 1 5 1982

Mr. Richard M. Holsten
President
Pittsburg and Midway Mining Co.
1720 South Bellaire
Denver, Colorado 80222

Dear Mr. Holsten:

In accordance with the terms of the Memorandum of Agreement for the McKinley Mine approved by the Chairman of the Advisory Council on Historic Preservation on July 16, 1982, the Office of Surface Mining (OSM) hereby approves the "Cultural Resource Plan - McKinley Mine" submitted by the Pittsburg & Midway Coal Mining Company on July 13, 1982, subject to your concurrence with the following 14 conditions:

1. Subsequent to completion of the survey, P&M will evaluate the validity/performance of the predictive model using qualitative and quantitive criteria. The quantitative criteria used will be selected from available analytical packages, such as "SPSS," on the basis of applicability to the characteristics of the data base.

2. Survey coverage in Zones II and III will be increased by 24 transects, to a total of 71. Subsequent to the completion of the transcet survey, P&M will submit an evaluation of the adequacy of the transect survey data to OSM for review. OSM reserves the right to request the survey of up to 24 additional transects if OSM determines that the additional transects would substantially improve the performance of the model. OSM will provide P&M with supporting technical justification for such additional transect survey.

3. In accordance with the provisions of paragraphs 3 and 4 of Attachment B to the MOA (Cultural Resource Plan Standards - McKinley Mine), separate documents concerning the evaluation of site significance/ eligibility and specific site treatment/mitigation will be prepared.

4. P&M will ensure that all cultural resource sites encountered during the survey of the North Lease Area will be properly recorded and evaluated, as specified.

5. Because the mine is on Ft. Defiance land, P&M will consult with the Ft. Defiance Chapter on behalf of the Chairman to determine what further ethnographic work, if any, is necessary for the North Lease Area. Evidence of the Chairman's views, if any, will be provided through the Ft. Defiance Chapter to OSM.

6. P&M will use aerial photographs and will consult with the Bureau of Land Management to secure pertinent data that may be used to identify any "Great Kiva" or Chacoan outlier or Chacoan road systems in the North Lease Area.

7. P&M will ensure that wash/arroyo exposures encountered during the course of the North Lease Area surveys will be checked for evidence of the buried sites. The presence of buried sites will be factored back into the predictive model and appropriate changes, if any, will be made to the survey strategy.

8. Until Section VIII.C. of the plan is completed, sites located during mining operations will be treated in accordance with the paragraph entitled "Resources Discovered during Mining Operations" in Attachment 1 to the MOA.

9. Notice of modifications to the plan submitted in accordance with Section VI.B. shall include justifications and necessary explanatory material to permit proper review by the parties to the MOA.

10. The last sentence on page 43 of the plan is hereby deleted, which is as follows:

    "Consequently, should fewer sites and/or site types than are predicted to occur in the North Lease Area be identified through the surveys undertaken in Zones I - IV, this shall not constitute evidence of a failure of the predictive procedure."

11. Pursuant to Section VII. "Unanticipated Property Types, Values or Site Locations," identification of such sites shall be factored back into the Predictive Model and appropriate changes, if any, will be made in the survey strategy.

12. In its submission of the proposed treatment program under Section V.C. of the Plan, P&M will include the information outlined in Table 8 only if P&M objects to the proposed treatment program developed by the independent archeological consultant.

13. Section V.B.2. of the Plan is amended by adding a new subsection 'g':

    "Further, the number of recorded sites subjected to data recovery, the relevance of known and projected sites to establishing and identifying factors of local variation for the important research questions, and the degree of protection currenty being afforded such sites shall be considered. Known sites and data will be given greater weight than projected sites and data when identifying sites for treatment."

14. In order to ensure that field work is of the highest quality possible, P&M will provide individuals from Federal and State agencies monitoring field operations at the site with a form to record their evaluation of the field work in progress and any sites they may locate during their field inspection. Completed forms will be provided to OSM and P&M by the inspecting party. A P&M representative will accompany all inspections of the site.

We would further request that P&M provide us with three additional documents for our records:

1. A description of the responsibilities of the independent archeological consultant and a copy of his/her credentials.
2. A two page discussion of evidence from pertinent existing literature that amplifies the applicability of the research questions to the area of the mine.
3. A revised copy of Table III-1.

As you know, as part of its review of the Plan, OSM conducted a public meeting on September 9, 1982, in Denver, Colorado, to fully explore the comments submitted by the parties to the MOA. After consideration of all comments received, we have determined that the above conditions will bring the Plan into full compliance with the terms of the MOA.

If you accept the above 14 conditions, please indicate your concurrence by signing in the appropriate space. Please return a copy of the signed agreement to this Office upon your signature.

Sincerely,

Acting Director

Concur: RM Holsten 9/10/82
Richard M. Holsten, President
Pittsburg and Midway Coal Mining Co.

cc: D. Willson, Attorney, Pittsburg and Midway Mining Co.
K. Tapman, Consultant, Pittsburg and Midway Mining Co.
F. Plog, Archeologist, Pittsburg and Midway Mining Co.
E. Friedman, Archeologist, Minerals Management Service
R. Burford, Director, Bureau of Land Management
J. Fritz, Deputy Assistant Secretary, Bureau of Indian Affairs
T. Merlan, New Mexico State Historic Preservation Officer

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CULTURAL RESOURCE PLAN — McKINLEY MINE

The McKinley Mine is a surface coal mine located in the San Juan Basin in New Mexico. The Pittsburg & Midway Coal Mining Co. (P&M) acquired the mining rights in 1959 and began mining operations in the early 1960's. Mining has proceeded continuously since the early 1960's under these rights, Federal leases, a Navajo lease and a series of Federal and State permits. The Mine is currently producing at a rate of approximately 5 million tons of coal annually.

While P&M's on-going mining operations at the McKinley Mine (on Federal and Indian lands) are being conducted in accordance with the terms of its mining plan which was approved in 1975, the Surface Mining Control and Reclamation Act of 1977 requires submission of an updated mine plan to the Office of Surface Mining, U.S. Department of the Interior (OSM), as part of an application for a "permanent progam mine plan permit" which will supercede existing permits and mine plan approvals. This application is pending before OSM.

In its review of P&M's application, OSM determined that additional steps were necessary to protect historic and archeological properties to be affected by mining operations in order to comply with the requirements of Section 106 of the National Historic Preservation Act. To satisfy this requirement, P&M submitted a proposed "Program for the Protection of Historic and Archeological Resources at the McKinley Mine" to OSM for approval.

The proposal was reviewed and endorsed by the Advisory Council on Historic Preservation on May 25, 1982. Subsequently, OSM and the Council concluded a Memorandum of Agreement (MOA) detailing the steps to be taken to protect historic and archeological resources at the McKinley Mine (Appendix I). In accordance with this Agreement, OSM directed P&M to prepare this Cultural Resource Plan for the McKinley Mine. Consistent with the requirements set forth in Attachment B of the Agreement, "Cultural Resource Plan Standards - McKinley Mine", the plan establishes specifications for the conduct of all cultural resource work to be performed by P&M at the Mine. The Plan consists of three principal components:

1. Specifications for the conduct of a survey of the undisturbed acreage in the North Lease Area.
2. Specifications detailing how sites located through the North Lease Area survey, or subsequently discovered during mining operations within the entire Mine area, will be evaluated for significance.
3. Specifications detailing how the appropriate treatment will be determined for significant sites located through the North Lease Area survey or subsequently discovered during mining operations within the entire Mine area.

Implementation of the Plan will satisfy applicable Federal requirements and the relevant conditions of OSM's approval of P&M's mine plan permit application.

I. RESEARCH QUESTIONS

Study of past human occupation of the McKinley Mine area could provide important new or important corroborative information concerning the history and prehistory of the San Juan Basin and surrounding areas. A series of relevant research questions is set forth in Appendix II (Research Questions). In summary, these are:

A. Questions pertaining to the rise and decline of complex societies and the relationships between "power-based" and "resilient" societies. Specifically, the questions relate to the nature of the Chacoan system and the reasons for its decline.

1. Settlement patterns: Do they indicate purposeful "colonization" of land which was previously essentially unoccupied, or a gradual increase in population and complexity?
   - a. Were the earliest sites sedentary or non-sedentary?
   - b. Were pithouse sites replaced by Chacoan - associated pueblos?
   - c. Were the Pueblo II (PII) and Pueblo III (PIII) settlement patterns of the area hierarchical?
2. Subsistence patterns: Do they reflect reliance on highly specialized or more diversified resource and subsistence practices, and how did these practices change through time?
3. Trade and exchange: What exchange relationships existed between inhabitants of the local and nearby areas?
   - a. Did trade goods come from Chaco or elsewhere?
   - b. Did the abundance of trade goods vary through time?
4. Abandonment: Why was the McKinley Mine area abandoned? What changes in settlement and subsistence patterns, and in trade and exchange, preceded and accompanied the abandonment?

B. Questions pertaining to Native American and Euro-american relations in the late 19th and early 20th centuries. Specifically, the questions relate to the nature of sociocultural change among the Navajo people.

1. The emergence of status differentiation based on economic factors and its relationship to economic change:
    - a. Were favorable upland grazing areas dominated by wealthier Navajo families?
    - b. If so, how were these families organized and how did they relate to the regional Euro-american dominated economic system?
2. The impact of wage labor and a cash economy: How did Navajo social organization, as reflected in settlement patterns and the organization of specific sites, change under the influence of wage-labor and participation in a cash economy?

All the above research questions are important, but they are not all equally applicable to the types of sites likely to occur in the North Lease Area. Table 1 shows the ranking of the research questions and their relative applicability based on:

1. whether there are currently enough data on the general research issue involved to permit its effective study without additional primary data;
2. whether information is available from the South Lease Area to permit appropriate comparison; and
3. whether it is likely that additional relevant data will be obtainable from the North Lease Area.

Table 1: Ranking of Research Questions

	Question	Relative Applicability and Ranking
1.	Were the earliest sites sedentary or non-sedentary?	Existing local data bearing on this question are limited. Based on existing data there is some probability of finding such sites. Few parallel studies have been undertaken and comparative data are limited. (Level 3 - low)
2.	Were pithouse sites replaced by Chacoan-associated pueblos?	Existing local data bearing on this question are limited. The likelihood of finding appropriate sites is relatively low. Comparative data exist in nearby areas and in the San Juan Basin. (Level 2 - intermediate)
3.	Were PII and PIII settlement patterns hierarchical?	Settlement pattern data from the South Lease Area can be employed in the analysis. The probability that survey will generate appropriate data in the North Lease Area is high. Comparable studies have been done elsewhere in the region and more such studies are being generated. (Level 1 - high)
4.	Were subsistence practices simple or diverse and intensified?	The likelihood of finding pertinent sites is relatively low based on existing data. Comparative data are available from the South Lease Area study and elsewhere in the San Juan Basin. (Level 1)
5.	Did trade goods come from Chaco or elsewhere?	Appropriate analyses were not undertaken using South Lease Area data, therefore local trade patterns cannot be reconstructed. Appropriate studies have been done in nearby areas and in the San Juan Basin generally providing a substantial comparative base. The probability of finding artifactual materials that can be used in the analysis is high. (Level 1)
6.	Did the abundance of trade goods vary through time?	While this question is similar to number 5, the likelihood of finding appropriate stratified or well dated sites is lower. (Level 2)
7.	Why was the McKinley Mine area abandoned?	This question would summarize the important elements of all previous questions. Therefore, as a pivotal question its ranking is high. (Level 1)

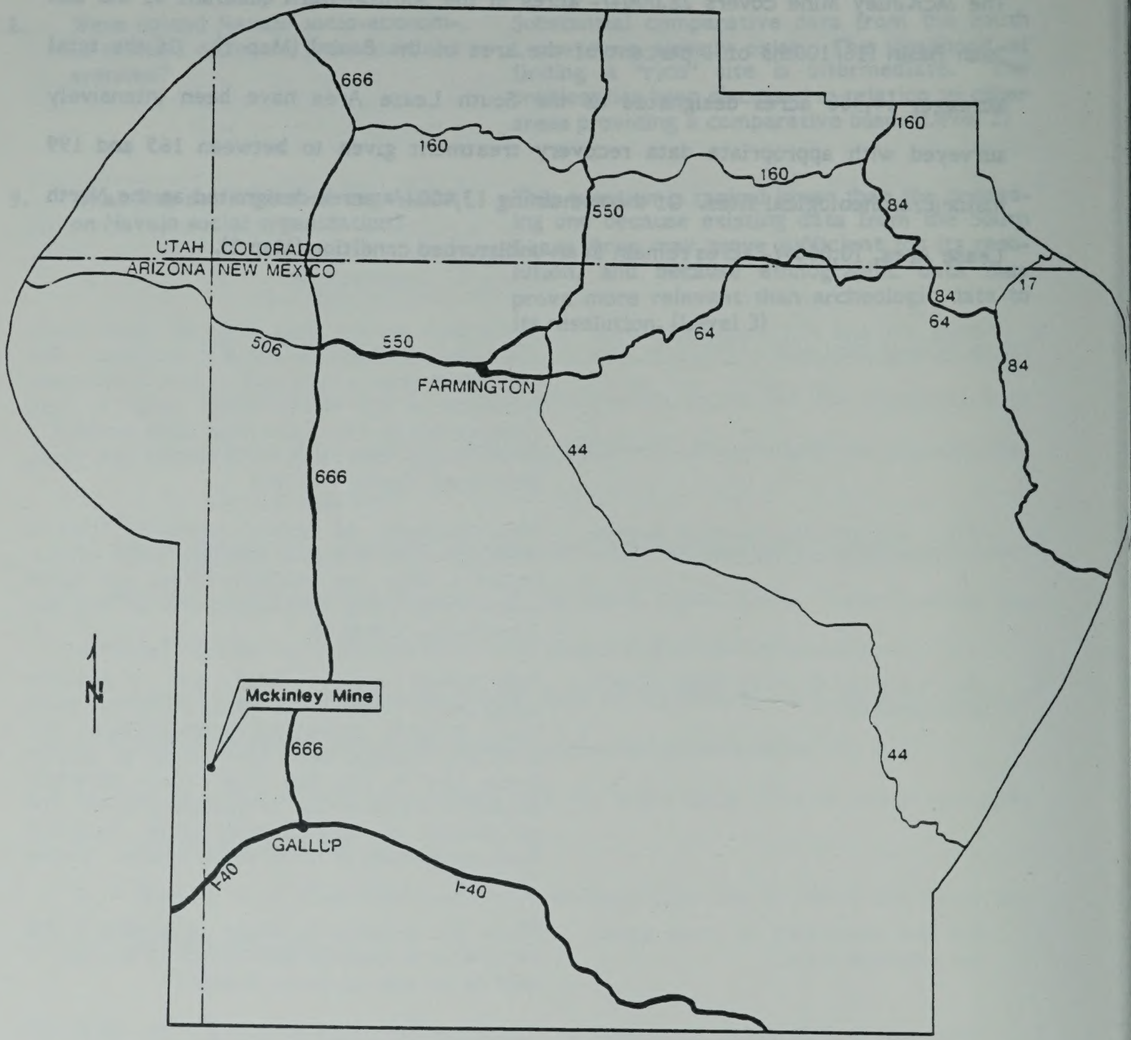
Table 1: Ranking of Research Questions (continued)

	Question	Relative Applicability and Ranking
8.	Were upland Navajo socio-economic systems different from low-land systems?	Substantial comparative data from the South Lease Area already exist. The likelihood of finding a "rico" site is intermediate. The problem has been discussed in relation to other areas providing a comparative base. (Level 2)
9.	What was the impact of wage-labor on Navajo social organization?	This question is ranked lower than the preceding one because existing data from the South Lease Area may prove sufficient for its resolution, and because ethnographic data may prove more relevant than archeologic data to its resolution. (Level 3)

II. AREA ENCOMPASSED

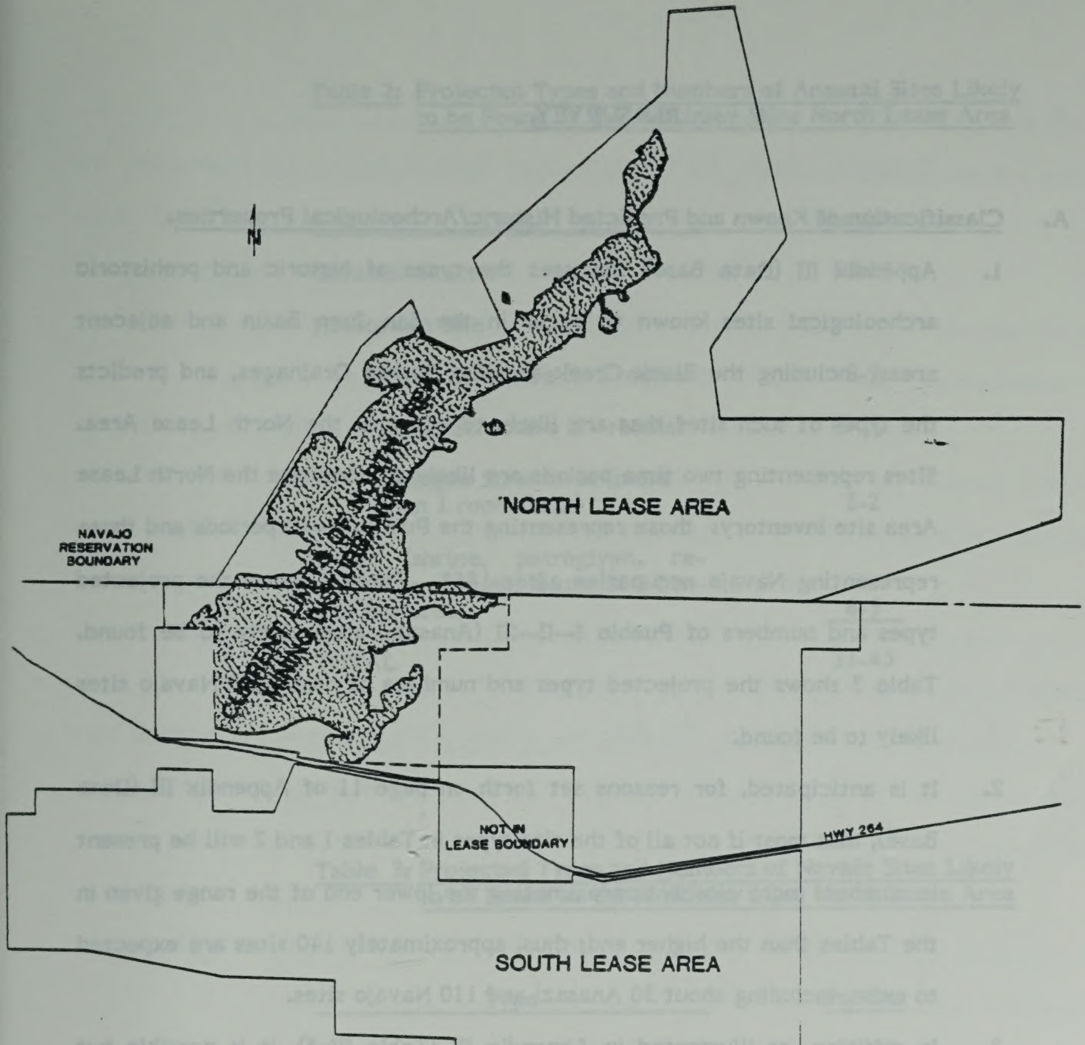
The McKinley Mine covers 28,000+/- acres in the Southwestern quadrant of the San Juan Basin (16/100ths of 1 percent of the area of the Basin) (Map 1). Of the total acreage, 14,300 acres designated as the South Lease Area have been intensively surveyed with appropriate data recovery treatment given to between 165 and 199 historic/archeological sites. Of the remaining 13,400+/- acres designated as the North Lease Area, 10,000+/- acres remain in an undisturbed condition (Map 2).

MAP 1. AREA OF THE SAN JUAN BASIN REGIONAL URANIUM STUDY



THE AREA SHOWN IS APPROXIMATELY 28,000 SQUARE MILES, OR 18,000,000 ACRES.

THE AREA OF McKINLEY MINE IS APPROXIMATELY 28,000 ACRES.



MAP 2

McKINLEY MINE NORTH & SOUTH LEASE AREAS (AS DEFINED FOR ARCHEOLOGICAL PURPOSES)

III. SURVEY

A. Classification of Known and Predicted Historic/Archeological Properties.

1. Appendix III (Data Base) discusses the types of historic and prehistoric archeological sites known to occur in the San Juan Basin and adjacent areas, including the Black Creek and Rio Puerco Drainages, and predicts the types of such sites that are likely to occur in the North Lease Area. Sites representing two time periods are likely to dominate the North Lease Area site inventory: those representing the Pueblo II—III periods and those representing Navajo occupation after 1868. Table 2 shows the projected types and numbers of Pueblo I—II—III (Anasazi) sites likely to be found. Table 3 shows the projected types and numbers of post-1868 Navajo sites likely to be found.
2. It is anticipated, for reasons set forth on page 11 of Appendix III (Data Base), that most if not all of the site types in Tables 1 and 2 will be present in numbers more closely approximating the lower end of the range given in the Tables than the higher end; thus, approximately 140 sites are expected to exist, including about 30 Anasazi and 110 Navajo sites.
3. In addition, as illustrated in Appendix III (Table III-5), it is possible but unlikely that sites representing the Archaic period and pre-1868 Navajo occupation will occur in the North Lease Area.
4. Sites representing other time periods, such as Paleo-Indian and Basketmaker II, are extremely unlikely to occur.

Table 2: Projected Types and Numbers of Anasazi Sites Likely to be Found at the McKinley Mine North Lease Area

Type	Number
Ceramic Scatter	10-15
Habitation Site	
Small Structure (1-2 rooms)	6-9
Large Structure (3+ rooms)	7-10
Multiple Structures (more than 1 roomblock)	2-2
Other (shrine, petroglyph, resource processing, water/soil control features)	6-9
TOTAL	31-45

Table 3: Projected Types and Numbers of Navajo Sites Likely to be Found at the McKinley Mine North Lease Area

Type	Number
Hogan	50-78
Campsite/Corral	28-42
Sweathouse	29-44
Other (Special activity loci)	6-9
TOTAL	113-173

B. Classification of Potential Values.

1. **Research Value:** As discussed more fully in Section IV, Evaluation, the number and types of sites located through the survey of the North Lease Area will be evaluated within the context of their potential for contributing important new or important corroborative information as defined by the research questions (See Appendix II).

2. **Sociocultural Value:** The data now available for review do not indicate that any of the types of sites likely to occur in the North Lease Area are perceived by the local Navajo people or others to have sociocultural value requiring protection. If any such sites do occur, they are likely to be shrines or burials. Sociocultural value will be determined through consultation with peoples having cultural affiliation with the area.

3. **Interpretive Value:** The data now available for review do not indicate that any of the types of sites likely to occur in the North Lease Area will possess attributes of special value for public interpretation of the historic or prehistoric human occupation of the area. Sites will be determined to have interpretive value if they possess the following characteristics:

   a) substantial integrity

   b) high information content

   c) high potential public access

   d) esthetic value

   e) esthetically pleasing environmental setting.

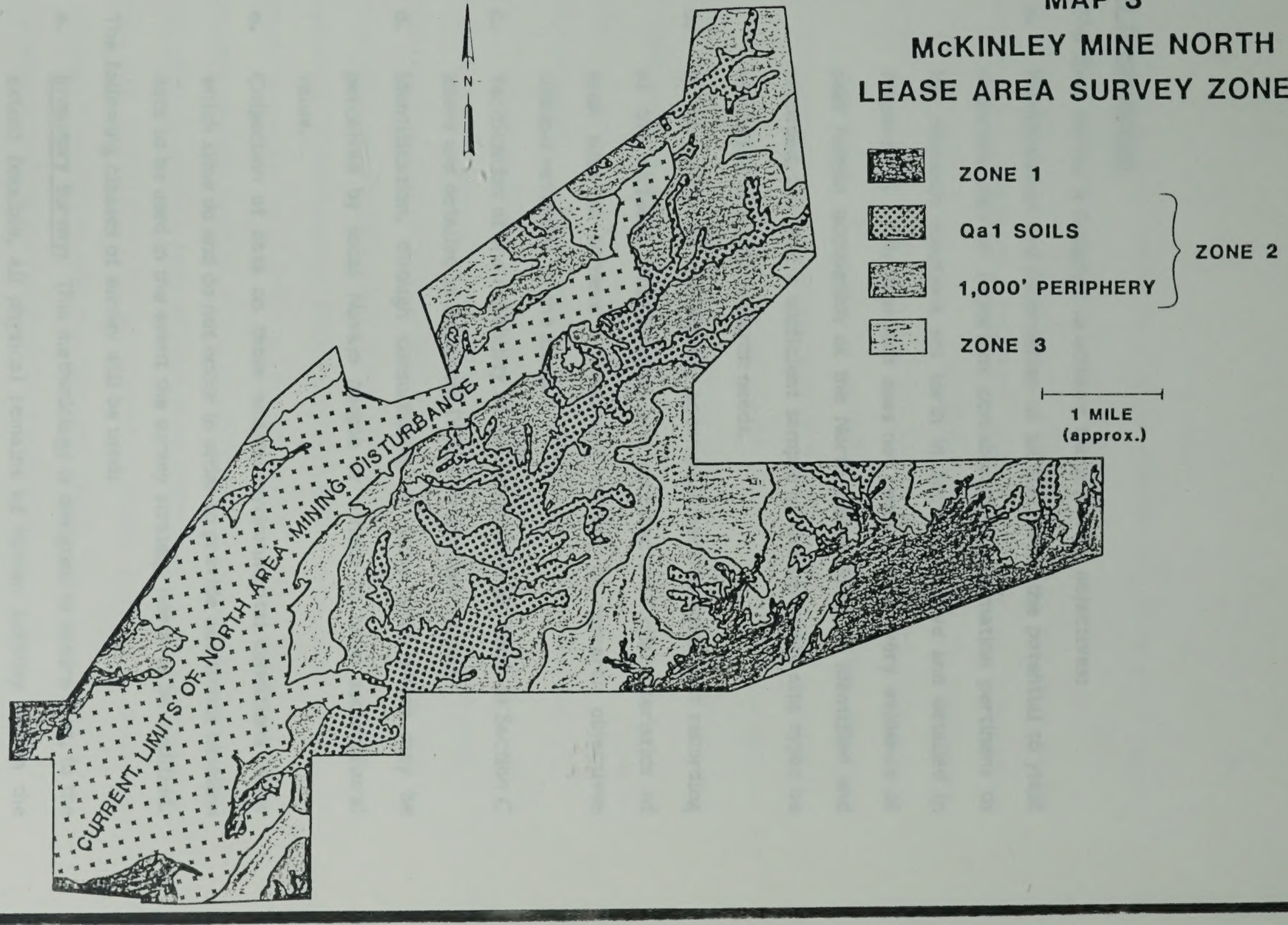
4. **Continuing or Adaptive Re-use:** Certain post-1868 Navajo sites which possess historic significance are probably experiencing continuing use today, or have been used until the recent past. Although some users of such sites may be reluctant to terminate this use, the decision of the Navajo Nation and of the Fort Defiance Chapter to commit the area to

surface mining renders consideration of this value moot. No properties of special architectural significance or value for adaptive re-use are anticipated to be found.

C. Predicted Site Locations

Appendix IV (Predictive Model) provides a thorough discussion of the factors used to predict the distribution of sites in the North Lease Area. Four subareas are distinguished (See Map 3):

1. **Zone I:** All lands below 7000' elevation. Almost all Anasazi sites are expected to occur here, including most if not all sites with structures. Most Navajo sites are also expected to occur here.
2. **Zone II:** All quarternary alluvial unit #1 (Qal, deep surface sediment) soil lands above 7000' elevation plus a peripheral study area of 1000'. Virtually all remaining Anasazi and Navajo sites are expected to occur here.
3. **Zone III:** All lands not included in Zones I and II. Except in special locations (Zone IV), no significant sites are expected to occur here. Isolated artifacts from any time period may occur here.
4. **Zone IV:** Special locations within Zones I - III, including springs, major stream confluences, promontories, cliff faces, and specific locations (if any) identified as culturally important by local Navajo people. Any remaining sites are expected to occur within this Zone, including such sites as shrines and petroglyphs. (Locations of Zone IV areas to be surveyed are not shown on Map 3 because they will be identified immediately prior to initiation of the survey. For further discussion see Appendix V - Survey Design - page 2.)



MAP 3
McKINLEY MINE NORTH LEASE AREA SURVEY ZONES

D. **Survey Specifications**

1. The field survey is designed to achieve the following objectives:

   a. Identification and recordation of all sites with the potential to yield important new or important corroborative information pertinent to the research questions set forth in Section I above and detailed in Appendix II. This approach does not require that every evidence of past human occupation of the North Lease Area be identified and recorded, but that a sufficient sample of the pertinent site types be identified to fulfill research needs.

   b. In the course of the survey, accomplishment of sufficient recording of the surface, stratification and architectural characteristics of such sites to achieve a maximum number of research objectives without returning to the sites.

   c. Verification of the reliability of the predictions set forth in Section C above and detailed in Appendix IV (the Predictive Model).

   d. Identification, through consultation, of those sites which may be perceived by local Navajo people or others to have sociocultural value.

   e. Collection of data on those natural environmental conditions under which sites do and do not occur in order to provide additional baseline data to be used in the event the survey strategy needs to be modified.

2. The following classes of survey will be used:

   a. **Inventory Survey:** This methodology is designed to ensure that, to the extent feasible, all physical remains of human activity within the survey area are identified.

      (1) All land surfaces (except the near vertical) are inspected by trained personnel spaced no more than 15 yards apart. Near

vertical surfaces are inspected in an equivalent manner to the extent feasible. If there are areas where it is not possible to determine the existence of sites (e.g., areas of deep recent sediments, landslides or impenetrable brush), they will receive special attention in the field at the time of survey or be identified for future study/monitoring during land disturbing activities.

(2) Sites, low-density artifact scatters and isolated finds are recorded, as appropriate.

(3) Mapping, photography, recordation, artifact collection, subsurface testing and analyses are done as needed. (See the guidelines set forth in Appendix V).

b. Sample Survey: The methods used are the same as for "inventory survey," but are applied only to selected parcels.

(1) Transects approximately 50 yards wide and ½ mile long are used. Center lines are marked with biodegradable flagging.

(2) Two-person survey teams are used to inspect each transect with team members spaced no more than 15 yards apart.

(3) The survey team proceeds from one end of the transect to the other, with one team member walking the center line and placing tapes and the other walking 15 yards away. At the end of the transect, the team returns on the other side of the center line, with one team member walking 6-8 yards from the centerline and the other walking 15 yards away.

(4) Environmental notes are kept on each transect regardless of whether any sites are located or not.

(5) Record keeping is carried out as specified above and in Appendix V.

c. Reconnaissance Survey: The methods used are the same as for "inventory survey," but are applied only within a specific distance of identified locations. For the purposes of this Plan, the land surface within a radius of 100 yards of designated Zone IV locations will be investigated to the extent feasible, taking into account the characteristics of the specific location (e.g., cliff faces will be inspected by walking along the ground at the bottom of the cliff and promontories will be inspected within the immediate area of the promontory itself).

3. Field survey work will be conducted as follows:

   a. All lands within Zone I will be subjected to inventory survey.

   b. All lands within Zone II will be subjected to a sample survey, with 37 transects comprising approximately 5 percent of the land surface.

   c. All lands within Zone III will be subjected to a sample survey, with 15 transects comprising approximately 7 percent of the land surface.

   d. All Zone IV locations will be subjected to a reconnaissance survey.

4. The total land surface to be subjected to inventory survey (Zone I) comprises 1500+/- acres. The total land surface to be subjected to sample survey (Zones II and III) will consist of 470+/- acres within the transects. The total land surface to be subjected to reconnaissance survey, comprising all Zone IV locations, has not yet been computed since these locations will be detailed later in the contract for conduct of the survey.

5. Prior to beginning field work on the survey, representatives of the Fort Defiance Chapter of the Navajo Nation will be consulted for guidance as to the sociocultural significance of known or suspected sites within the North

Lease Area, and as to individuals or groups who could be contacted for further information. Existing ethnographies for the area will be used for guidance. Since the McKinley mine area has been the subject of recent extensive ethnographic fieldwork, no further such study is proposed or will be conducted during the survey.

IV. EVALUATION OF SIGNIFICANCE

This section describes the decision-making framework that will be used to determine the significance of all sites located through the survey. These evaluations will be made by the independent archeological consultant (IAC). The evaluations will be submitted to all parties to the MOA for review.

A. Using an evaluation form developed by the IAC, estimates of the significance of each site identified during the survey will be made. Recording done during the survey will include this preliminary evaluation for each site.

B. Upon completion of the survey and submission of the required survey report (including specified analyses), the significance of each site identified during the survey will be evaluated.

C. The following factors will be used in making evaluations of significance:

1. National Register Criteria (a)-(c):

   Does the site meet National Register of Historic Places criteria specified in 36 CFR 60.4(a)-(c)? In general, this question requires consideration of each site's possible association with persons or groups significant in the area's history or prehistory and the architectural/artistic qualities of the site. The associational value of sites will be considered in consultation with the Fort Defiance Chapter while their architectural/artistic value will be considered on a case-by-case basis where pertinent (e.g., with respect to petroglyph sites).

2. National Register Criterion (d):

   The evaluation of a site's potential for scientific use will be accomplished by determining if a site is likely to contribute important new or important corroborative information on the history or prehistory of the San Juan Basin, and/or the Black Creek and Rio Puerco Drainages sufficient to qualify it for inclusion in the National Register of Historic Places under criteria specified in 36 CFR 60.4(d).

a. The matrix shown in Table 4, Evaluation Matrix, will be applied to each site identified in the survey. Application of this matrix will identify those site types which are likely to contribute information useful in answering each research question. Those sites meeting these requirements will be considered likely to contribute such knowledge.

b. Any unanticipated site type will be evaluated on a site-by-site basis within the context of the regional overview documents. Any site dating from a time period prior to Basketmaker III will be considered to be likely to contribute important new or important corroborative knowledge on the prehistory of the area.

c. For the purposes of evaluation, a site is a defineable and interpretable cluster of artifacts or features.

Table 4: Evaluation Matrix

Research Question	Time	Type	Size	Condition	Nature of Deposits	Expected Pertinent Data Sources
1. Were the earliest sites sedentary or non-sedentary?	BM III-P I	Small habitation or cave site, or artifact scatter	NA	Limited disturbance only	Ideal: stratified site Acceptable: Single component	Permanent or impermanent architecture, artifacts and chronometric specimens sufficient for dating
2. Were pithouse sites replaced by Chacoan-associated pueblos?	BM III-P II	Large or small habitation site(s)	NA	Disturbed is acceptable	Ideal: stratified site Acceptable: Two single component sites	Architecture and artifacts and chronometric specimens sufficient for dating
3. Were the P II and P III settlement patterns of the area hierarchical?	P II, III	Large or small habitation sites	Large and small	Disturbed is acceptable	Substantial architecture and midden deposits	Presence/absence of non-local material, Chacoan architecture, location
4. Were subsistence practices in the area simple or diverse and intensified?	P II, III	Habitation or cave site, and/or artifact scatter, and/or water/soil control features	NA	Limited disturbance is acceptable for cave. Disturbance is acceptable for others.	Ideal: stratified deposits	Dry cave deposits with preserved floral & faunal remains. Wet deposits with remains obtainable through flotation. Material suitable for dating. Organization, function, dating of water/soil control features. Functionally indicative artifacts, features.
5. Did trade goods come from Chaco or elsewhere?	P II, III	Large or small habitation sites and ceramic scatters	NA	Disturbed is acceptable	Acceptable: surface or subsurface site	Presence/absence and/or type of non-local materials

Table 4: Evaluation Matrix (continued)

Research Question	Time	Type	Size	Condition	Nature of Deposits	Expected Pertinent Data Sources
6. Did the abundance of trade goods vary through time?	BM III-P III	Same as above	NA	Limited disturbance only	Ideal: deep stratified sites Acceptable: several shallow or surface single-component sites	Varying quantities of non-local materials
7. Why was the McKinley Mine area abandoned?	P III (late)	All types	NA	Disturbed is acceptable	Acceptable: surface or subsurface site	Faunal/floral materials, artifacts, features, reflecting incipient environmental change, subsistence shifts, and/or trade pattern fluctuations
	P IV-V	Habitation	NA	Disturbed is acceptable	Acceptable: surface or subsurface site	Any and all classes of data
8. Were upland Navajo socio-economic systems different from low-land systems?	Post-1868	Hogan(s), preferably with associated features	Large is preferred.	Disturbed is acceptable	Ideal: complex surface features with subsurface trash deposits, etc., and informants who recall living/visiting the site Acceptable: any upland Navajo site	Organization of settlement, internal organization of hogan(s), presence/absence/quantity/type of modern artifacts
9. What was the impact of wage-labor on Navajo social organization?	Early 20th century	Hogan, campsite/corral site	NA	Disturbed is acceptable	Sufficient surface features to permit functional characterization of site	Organization of settlement, internal organization of hogan(s), datable material

3. **Public Interpretation:**

Does the site have potential value for public interpretation? No such sites are expected, but an unusual site (e.g., a large Paleo-Indian site) or a site clearly indicative of answers to a major research question (e.g., a site where the abandonment of the region might be interpreted) might have such value. Such values will be considered on a case-by-case basis, using the criteria in Section III.B.3 (Survey) above, should any such sites be found.

4. **Adaptive Re-use:**

Does the site have potential for continuing or adaptive re-use? As discussed in Section III.B.4 above, while some sites now in use might have potential for continuing use, the opportunity for them to be so used seems effectively to have been foreclosed by the corporate decision of the Navajo Nation. Sites with historic or architectural values warranting adaptive re-use are not expected. These values will be considered on a case-by-case basis should they be apparent in a discovered site.

D. In accordance with the provisions of Paragraph 8 of the Plan Standards, P&M will submit the proposed site evaluations from the IAC to all parties to the MOA for review and comment simultaneously with its submission of a proposed Treatment Program. (See Section V - Treatment of Sites.)

V. TREATMENT OF SITES

A. Non-archeological Sites:

As discussed in Section III (Survey), sites warranting treatment to conserve values other than those of scientific/archeological research are not expected to occur in the North Lease Area. Should any be found to exist, they will be considered on a case-by-case basis in consultation with the appropriate representatives of the Navajo Nation, the Fort Defiance Chapter and any family or other group concerned.

B. Archeological Sites:

For sites having scientific/archeological research value, a phased approach will be used to determine the appropriate treatment. The objective of this approach is to ensure that the number of sites to be given treatment (in addition to the data recovery methods used during survey), and the data recovery methods to be used on such sites, are justifiable in terms of providing important new or important corroborative information useful in addressing the relevant research question.

A series of qualitative and quantitative analyses will be carried out by the IAC to identify the number of sites, if any, in the North Lease Area warranting additional treatment and the specific data recovery measures to be used for each site. After completion of these analyses, the ideal scientific/archeological treatment program will be identified.

A final analysis will be triggered only in the event that the proposed treatment program is found to be unacceptable for non-archeological reasons (e.g., cost).

After the above analyses are completed a proposed Treatment Program will be submitted to all parties to the MOA for review prior to its implementation.

1. **Identifying Appropriate Data Recovery Treatment.**

The first objective is to identify those data recovery methodologies that will maximize recovery of the important new or important corroborative data that a site may contain and which make the site significant. This is defined as "Maximized Data Recovery," (MDR). This analysis will be applied to each site determined to be significant through application of the evaluation process set forth in Section IV (Evaluation of Significance). The MDR will be identified as follows:

a. Table 4 (Evaluation Matrix) identifies the types of data that can be used to address each research question.

b. Table 5 lists possible treatment measures.

c. Table 6 correlates the information from Table 4 with the information in Table 5. It also identifies the appropriate analytical/testing methods to be used.

Table 5: Data Recovery Methodologies

1. Recording
   - photograph of site
   - photograph of features
   - aerial photograph
2. Mapping
   - location
   - site
   - complex features (e.g., hogan)
3. Surface Collection
   - sample
     - total (sites under 160 s.m.)
     - 10 4x4 meter units (sites between 160 and 1600 s.m.)
     - 10% (sites over 1600 s.m.)
   - collection from specific features
   - non-random collection of diagnostics
     - ceramics
     - projectile points
     - exotics
4. Stratigraphy
   - auger
   - shovel
5. Environmental Data Collection
   - vegetation
   - soils
6. Subsurface
   - test excavation
     - pits
       - architectural definition
       - corner testing
       - artifact sampling
       - extra-mural testing
       - chronometric sampling
       - environmental sampling
     - trench
   - geophysical
     - resistivity testing
     - magnetometer testing
     - radar testing
   - full excavation
     - architectural exposures
     - artifact acquisition
     - extra-mural exposures
     - chronometric data gathering
     - environmental data gathering
   - stripping to expose features

Table 6: Treatment Matrix I — Determination of Data Recovery Methodologies Appropriate to Research Questions

Research Question 1: Were the earliest sites in the area sedentary or non-sedentary?

Site Type: Small habitation or cave site, or artifact scatter.

Methodology	Data Retrieved	Data Needed for MDR	Analysis
Mapping -- site	number and size of sites	number & size of sites	reconstruction of population trends
Surface collection -- sample -- specific features -- diagnostics	temporally diagnostic surficial artifacts	sufficient artifact sample for dating	stylistic analysis sufficient for dating
Stratigraphy	test pit notes	depth & nature of deposits	stratigraphic
Test excavation			
-- corner testing	number & size of sites	map of sites	bonding/abutting patterns and variation in room size/function
-- artifact sampling	temporally diagnostic artifacts	sufficient artifact sample for dating	stylistic analysis sufficient for dating
-- chronometric sampling	radio-carbon, tree-ring samples, etc.	sufficient samples for dating	required dating technique
-- trench	subsurface site description	location of site features	profiles of trenches
geophysical testing (all)	subsurface map	location of site features	computer interpretation (alternative to trenching)
Full excavation			
-- architectural exposure	architectural description of some rooms	sample of room size/function	description of architectural pattern
-- stripping	map of site	location of site features	analysis of intra-site settlement patterns

Table 6: Treatment Matrix I -- Determination of Data Recovery Methodologies Appropriate to Research Questions

(continued)

Research Question 2: Were pithouse sites replaced by Chacoan-associated pueblos?

Site Type: Large or small habitation site(s).

Methodology	Data Retrieved	Data Needed for MDR	Analysis
Surface collection	temporally diagnostic surficial artifacts	sufficient artifact sample for dating	stylistic analysis sufficient for dating
-- sample			
-- specific features			
-- diagnostics			
Stratigraphy	test pit notes	depth & nature of deposits	stratigraphic
Test excavation			
-- corner testing	number & size of sites	maps of sites	bonding/abutting patterns and variation in room size/function
-- artifact sampling	temporally diagnostic artifacts	sufficient artifact sample for dating	stylistic analysis sufficient for dating
-- chronometric sampling	radio-carbon, tree-ring samples, etc.	sufficient samples for dating	required dating techniques
-- trench	subsurface site description	location of site features	profiles of trenches
Geophysical testing (all)	subsurface map	location of site features	computer interpretation (alternative to trenching)
Full excavation			
-- architectural exposures	architectural description of some rooms	sample of room size/function	description of architectural pattern
-- environmental data gathering	map of site	location of additional features	analysis of intra-site settlement patterns

Table 6: Treatment Matrix I — Determination of Data Recovery Methodologies Appropriate to Research Questions

(continued)

Research Question 3: Were PII and PIII settlement patterns of the area hierarchical?

Site Type: Large or small habitation sites.

Methodology	Data Retrieved	Data Needed for MDR	Analysis
Mapping -- location	relative site location	location of a sample of sites within a contiguous area	spatial analyses
-- site	relative site sizes	sample of sites within a contiguous area	rank size & other hierarchical analyses
Surface collection			
-- sample -- specific features -- diagnostics	temporally diagnostic surficial artifacts	sufficient artifact sample for dating	stylistic analysis sufficient for dating & identification of non-local goods
Stratigraphy	test pit sites	depth & nature of deposits	stratigraphic
Test excavation			
-- corner testing	number & size of sites	map of sites	bonding/abutting patterns and variation in room size/function
-- artifact sampling	temporally diagnostic artifacts	sufficient artifact sample for dating & characterizing non-local goods	stylistic analysis sufficient for dating & analysis of raw materials/technology to identify non-local goods

Table 6: Treatment Matrix I — Determination of Data Recovery Methodologies Appropriate to Research Questions

(continued)

Research Question 3: Were PII and PIII settlement patterns of the area hierarchical?

Site Type: Large or small habitation sites

Methodology	Data Retrieved	Data Needed for MDR	Analysis
-- chronometric sampling	radio-carbon, tree-ring samples, etc.	sufficient samples for dating	required dating techniques
-- trench	subsurface site description	location of site features	profiles of trenches
Geophysical testing (all)	subsurface map	location of site features	computer interpretation (alternative to trenching)

Table 6: Treatment Matrix I — Determination of Data Recovery Methodologies Appropriate to Research Questions

(continued)

Research Question 4: Were subsistence practices in the area simple or diverse and intensified?

Site Type: Habitation or cave site and/or artifact scatter, and/or soil/water control features.

Methodology	Data Retrieved	Data Needed for MDR	Analysis
Recording (all photos)	photo of soil/water control features	sample of soil/water control features	description of features
Mapping -- location	relative site location & soil/water control features	relative location of soil/ water control features	spatial analyses
-- site	relative site sizes & map of soil/water control features	sample of soil/water control features	description of features
Surface collection -- sample -- diagnostic	temporally diagnostic surficial artifacts	sufficient artifact sample for dating	stylistic analysis sufficient for dating
Environmental data collection	relationship of site to environmental features	relationship of soil/water control features to slope, soil, veg., etc. and context for interpretation	catchment & other locational anayses
Text excavation -- artifact sampling	temporally diagnostic artifacts, floral & faunal data	sufficient artifact sample for dating & to characterize variation in time & space	stylistic analysis sufficient for dating, identification of specimens & analysis of spacial & temporal patterns

Table 6: Treatment Matrix I — Determination of Data Recovery Methodologies Appropriate to Research Questions

(continued)

Research Question 4: Were subsistence practices in the area simple or diverse and intensified?

Site Type: Habitation or cave site and/or artifact scatter, and/or soil/water control features.

Methodology	Data Retrieved	Data Needed for MDR	Analysis
-- extra-mural testing	radio-carbon, tree-ring samples, etc.	sufficient samples for dating & to determine strata of site	required dating techniques
-- environmental sampling	pollen & sediment samples	sufficient samples to characterize environment & environmental variations	palynology & sedimentology

Table 6: Treatment Matrix I — Determination of Data Recovery Methodologies Appropriate to Research Questions

(continued)

Research Question 5: Did trade goods come from Chaco or elsewhere?

Site Type: Large or small habitation sites and ceramic scatters.

Methodology	Data Retrieved	Data Needed for MDR	Analysis
Surface collection -- sample -- diagnostic	temporally diagnostic surficial artifacts (non-local goods)	sufficient artifact sample for dating & characterization of source area	sylistic analysis sufficient for dating & source analysis
Text excavation -- artifact sampling	same as above for subsurface artifacts	same as above	same as above
-- chronometric sampling	radio-carbon, tree-ring samples, etc.	sufficient samples for dating	required dating techniques

Table 6: Treatment Matrix I -- Determination of Data Recovery Methodologies Appropriate to Research Questions

(continued)

Research Question 6: Did the abundance of trade goods vary through time?

Site Type: Large or small habitation sites and ceramic scatters.

Methodology	Data Retrieved	Data Needed for MDR	Analysis
Surface collection -- sample -- diagnostic	temporally diagnostic surficial artifacts (non-local items)	sufficient artifact sample for dating & characterization of source area	stylistic analysis sufficient for dating & source analysis
Text excavation -- artifact sampling	same as above for subsurface artifacts	same as above	same as above
-- chronometric testing	radio-carbon, tree-ring samples, etc.	sufficient samples for dating	requried dating techniques

Table 6: Treatment Matrix I — Determination of Data Recovery Methodologies Appropriate to Research Questions

(continued)

Research Question 7: Why was the McKinley Mine area abandoned?

Site Type: All types.

Methodology	Data Retrieved	Data Needed for MDR	Analysis
	This question is a composite of questions 3, 4 and 6 and would require the same types of treatments as are specified under each question.		

Table 6: Treatment Matrix I — Determination of Data Recovery Methodologies Appropriate to Research Questions

(continued)

Research Question 8: Were upland Navajo socio-economic systems different from low-land systems?

Site Type: Hogans, preferably with associated features.

Methodology	Data Retrieved	Data Needed for MDR	Analysis
Mapping -- location	relative site location (environment/other sites)	location of a sample of sites within a contiguous area	spatial analyses
-- site	relative site sizes & distribution of features	sample sufficient for comparison with South Lease Area	statistical comparison between North and South Lease Area data
Surface collection -- sample -- diagnostics	temporally diagnostic surficial artifacts (including Anglo material)	sufficient artifact sample for dating & making comparisons with South Lease Area	dating of historic artifacts & statistical comparison with South Lease Area data
Environmental data collection	soil & vegetation classification	description of contiguous area	comparison of North & South Lease Area locational patterns
Test excavation -- artifact sampling	temporally diagnostic subsurface artifacts (including Anglo material)	sufficient artifact sample for dating & making comparisons with South Lease Area	dating of historic artifacts & statistical comparison with South Lease Area data
-- chronometric sampling	tree-ring specimens	sufficient samples for dating	dendrochronology
-- environmental sampling	floral & faunal samples	sufficient samples to compare subsistence patterns with South Lease Area	identification of specimens & statistical comparison with South Lease Area data

Table 6: Treatment Matrix I — Determination of Data Recovery Methodologies Appropriate to Research Questions

(continued)

Research Question 9: What was the impact of wage-labor on Navajo social organization?

Site Type: Hogan, camp/corral site.

Methodology	Data Retrieved	Data Needed for MDR	Analysis
Mapping -- location	relative site location (environment/other sites)	location of a sample of sites within a contiguous area	spatial analyses
-- site	relative site sizes & distribution of features	sample with sufficient time variations to plot changes	time sense analysis of changing intra-site settlement patterns
Surface collection -- sample -- diagnostics	temporally diagnostic surficial artifacts (including Anglo material)	sufficient artifact sample for dating & characterizing change in use of Anglo material	dating of historic artifacts, functional analysis & analysis of change through time
Environmental data collection	soil & vegetation classification	description of contiguous area	spatial analysis of changing environmental patterns
Test excavation -- artifact sampling	temporally diagnostic subsurface artifacts (including Anglo material)	sufficient artifact sample for dating & characterizing change in use of Anglo material	dating of historic artifacts, functional analysis & analysis of change through time
-- chronometric sampling	tree-ring samples	sufficient samples for dating	dendrochronology
-- environmental sampling	floral and faunal samples	sufficient samples to characterize change through time	identification of specimens & time series analyses

2. Identifying Sites to be Treated.

The second objective is to establish the number of sites, if any, in the North Lease Area that should receive additional treatment. To achieve this objective, the following factors will be analyzed:

a. After the MDR for each significant site is identified, the sites will be grouped into "pools" relevant to each research question. Each pool may contain several different site types if they are relevant to the particular research question. A given site may be placed in more than one pool.

b. Using the same site classification system as applied to sites in the North Lease Area (See Section III, Table 4), the number of similar site types which are relevant to the research question and are known to exist outside of the North Lease Area will be identified. This number will be obtained from:

   (1) South Lease Area data

   (2) SJBRUS data

   (3) Museum of New Mexico Laboratory of Anthropology data

   (4) new information recovered by archeologists in nearby areas during the time the survey is proceeding.

c. The potential number of similar site types (with respect to each pool) within the San Juan Basin and related areas, and their distribution, will be projected.

d. The projected number of sites within the San Juan Basin and related areas needed to effectively address each research question will be identified as will the preferred distribution pattern. Comparing this number (and the distribution pattern data) with the number of known sites identified under 'b' above will permit identification of the number of North Lease Area sites within each pool that could justifiably be used to provide important new or important corroborative information on each research question in terms of:

(1) whether or not there is a need to study additional sites (or other units) to adequately address each research question within the general context of the San Juan Basin and related areas;

(2) whether or not there is a need to study additional sites (or other units) to adequately characterize local variation in addressing each research question; and

(3) whether or not sufficient sites (or other units) remain elsewhere to ensure that each research question may be adequately addressed.

e. Once the number of sites that could justifiably be used to provide additional information is identified within a pool, the data recovery treatments given each site in the pool during survey will be evaluated to determine whether there is a need to recover additional information from any such sites. If additional information is required from any site, the MDR treatment will be identified.

f. A summary of the basic factors to be used in determining the appropriate number of sites in the North Lease Area requiring additional data recovery treatment is shown in Table 7, Treatment Matrix II.

Table 7: Treatment Matrix II - An Example of Comparative Analysis

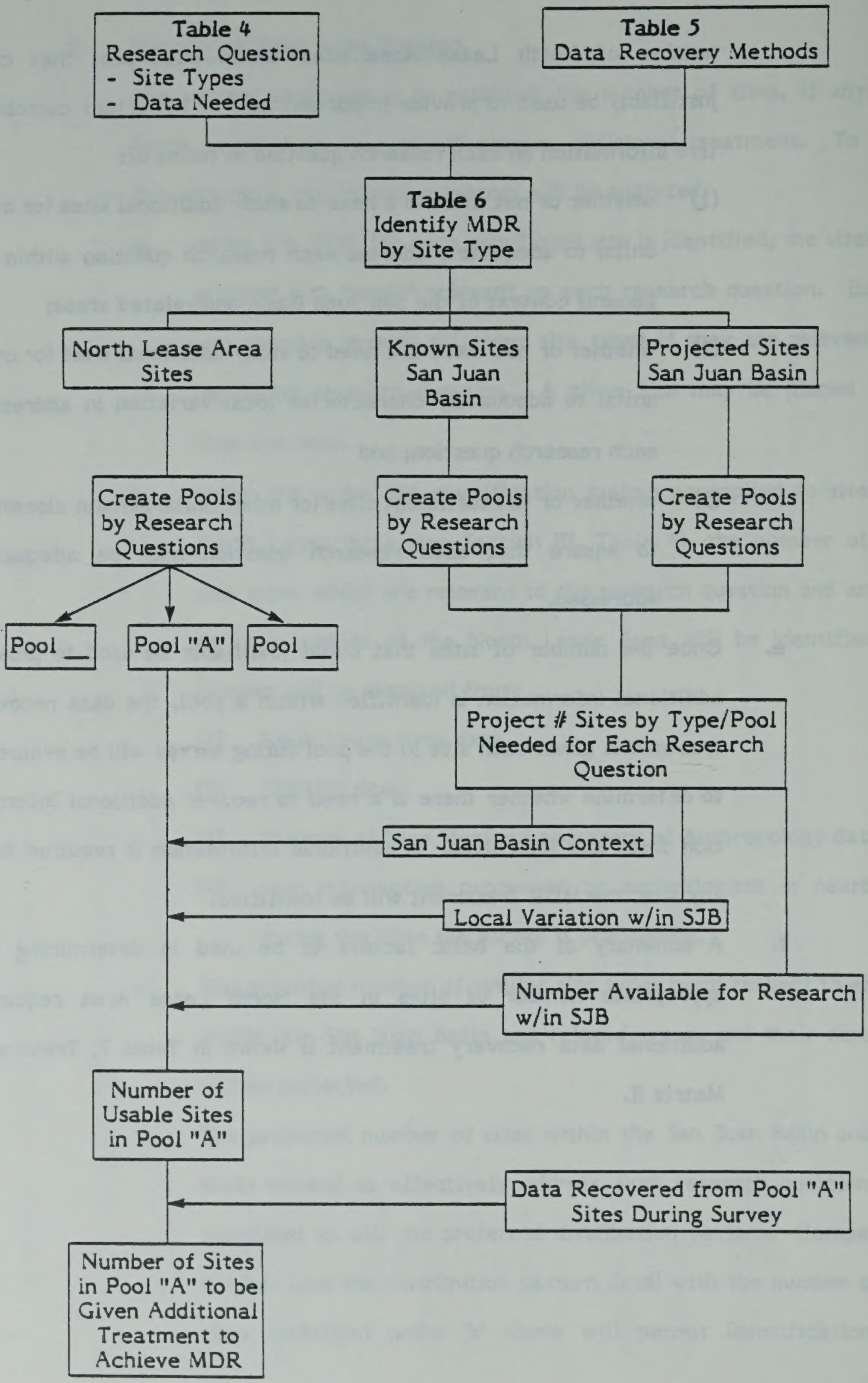


Table 4
Research Question
- Site Types
- Data Needed
Table 5
Data Recovery Methods
Table 6
Identify MDR
by Site Type
North Lease Area Sites
Known Sites San Juan Basin
Projected Sites San Juan Basin
Create Pools by Research Questions
Create Pools by Research Questions
Create Pools by Research Questions
Pool __
Pool "A"
Pool __
Project # Sites by Type/Pool Needed for Each Research Question
San Juan Basin Context
Local Variation w/in SJB
Number Available for Research w/in SJB
Number of Usable Sites in Pool "A"
Data Recovered from Pool "A" Sites During Survey
Number of Sites in Pool "A" to be Given Additional Treatment to Achieve MDR

3. **Treatment Program.**

The treatment program identified at the conclusion of 1 and 2 above will be carried out, unless P&M objects to the costs of doing so. In the latter case, Treatment Matrix III (shown on Table 8) will be applied to identify those factors that must be considered in balancing scientific/archeological research needs against socio-economic cost factors to reach a final treatment program that is in the overall public interest.

C. **Review and Approval of the Treatment Program:**

In accordance with the provisions of Paragraph 8 of the Plan Standards, P&M will submit its proposed Treatment Program to all parties to the MOA for review and comment 20 days prior to implementation.

Table 8: Treatment Matrix III — Factors To Be Used To Evaluate Public Interest

1. **Direct Cost of Proposed Treatment:** (in terms of time and money)
    - a. by site
    - b. by pool
    - c. total of all work
2. **Threat Level:**
    - a. immediate
    - b. deferred (specify time)
    - c. not threatened
3. **Cost Impact Analysis:** (illustrative factors to be considered)
    - a. P&M's operating costs and scheduling
    - b. P&M's ability to meet contractual obligations
    - c. P&M's customers, their operations and product
    - d. P&M's competitive market position
    - e. P&M's employees
    - f. P&M's loss or delay of mineable reserves
    - g. P&M's delay in using mineable reserves
    - h. Regional/National energy production
    - i. Loss of royalties, etc. to the Navajo Nation and the Federal Government
4. **Importance of Research Questions:** (see Table 1 for ranking)
5. **Data Availability and Suitability:**
    - a. other known similar sources (sites)
    - b. other projected similar sources
    - c. other types of primary data
6. **Impact on Research Objectives:**
    - a. number of sites which could be treated (scale)
    - b. impact on each research question of treating x number of sites (statistical analysis)
    - c. impact on each research question of deferring treatment

VI. MODIFICATION

A. **General flexibility:** This Plan will not be interpreted inflexibly but will be subject to adjustment to reflect field conditions, discoveries during the conduct of field work, the results of consultations between the fieldwork contractor and the IAC, and the recommendations of the monitoring parties to the MOA.

B. **Specific Modifications:** The Plan may be modified to respond to the discovery of an unanticipated site or site type. Modifications which involve increasing the land surface to be surveyed, the intensity of the survey or otherwise increasing the scope of work for a site or class of sites may be made without prior consultation with OSM. However, notice of this type of change will be provided to OSM. Modifications which materially decrease the land surface to be surveyed, the intensity of the survey or otherwise materially decreasing the scope of work for a site or class of sites will not be made without providing all parties to the MOA 10 days prior notice of such proposed modification.

C. **Evaluation of Predictions:** Any evaluation of predictions of numbers of site types anticipated to be located in the North Lease Area shall take into account that such predictions may exceed actual observations. Consequently, should fewer sites and/or site types than are predicted to occur in the North Lease Area be identified through the surveys undertaken in Zones I - IV, this shall not constitute evidence of a failure of the predictive procedure.

VII. UNANTICIPATED PROPERTY TYPES, VALUES OR SITE LOCATIONS

Unanticipated sites may be found in the course of the survey and these logically must fall into one of two categories: "common" sites which are found in unexpected places and "unexpected" sites. Responses to such occurences will be determined by the IAC.

A. "Common Sites": These are examples of site types which occurred in some abundance in the South Lease Area and which are known to exist in significant numbers in the San Juan Basin, and in the Black Creek and/or Rio Puerco Drainages (PII, PIII and post-1868 Navajo sites). These site types are expected to occur in the North Lease Area as well, and in usually predictable locations. It is anticipated that the inventory, sample and reconnaissance surveys will identify a sufficient sample of such site types to provide a reliable basis for addressing at least Level I research questions (See Table 1). Such additional "common" sites are redundant in terms of currently defined research questions of importance to the study of the history and prehistory of the McKinley Mine area.

1. In an effort to ensure that a large enough sample of sites is identified through the survey to permit treatment choices to be made easily, the survey strategy may be adjusted if "common" sites are found outside of Zone I where they are expected to be concentrated.
2. If "common" sites are found by the sample surveys in Zone II, an effort will be made to refine the predicted distribution of sites within that Zone. If refinement is feasible, the subarea within Zone II where sites are predicted to occur may be subjected to further survey. This decision will be based on an estimate (using a 95 percent confidence interval) of the additional land surface, if any, that needs to be surveyed to insure that — in conjunction with those sites located in Zones I and IV -- a sufficient number of sites will be found to allow treatment choices among sites which are likely to

yield important information relevant to the research questions. This additional land surface area will be subjected to increased survey, as appropriate.

3. If "common" sites are found in the sample surveys in Zone III, the same procedure will be used to determine the need for additional survey work.

4. If "common" sites are found in the reconnaissance surveys in Zone IV, the reconnaissance area will be expanded from 100 to 200 yards around each location where such a site has been found and the expanded area will be subjected to reconnaissance survey. If no additional sites are located within the expanded area, survey will cease. If additional sites are located, a decision will be made whether to expand the area further or to use the mechanism set forth under subparagraph 2 above. (Definition of any expansion zone shall take into account both the site type and the environmental features of the location).

B. **"Unexpected" Sites:** These sites are examples of types that are unlikely to occur in the North Lease Area or which are known to exist in limited number in the San Juan Basin, the Black Creek and/or Rio Puerco Drainages (Paleo-Indian, Archaic, Basketmaker I, Basketmaker II, and pre-1868 Navajo sites and Chacoan outliers).

1. If an "unexpected" site is found in Zone I but not in Zones II, III or IV, its existence will be considered adequate evidence that such sites are patterned in ways similar or identical to the patterns of "common" sites. Consequently, no additional survey would be undertaken.

2. If an "unexpected" site is found during survey of Zones II or III, the course of action would depend on an evaluation of the characteristics of the site and its location. If the site bears a clear relationship to an environmental feature (e.g., a Chacoan outlier on a hitherto unknown Chacoan road), additional reconnaissance survey may be undertaken with specific refer-

ence to that relationship. If it is possible to predict the distribution of other similar site types, sample survey may be undertaken to test such predictions. If such predictions are not feasible, or are not sustained through testing, further survey appropriate to the circumstance will be conducted.

3. If an "unexpected" site is found by the reconnaissance surveys in Zone IV, the same procedure as described for "common" sites found in Zone IV will be used.
4. With respect to "unexpected" sites, modification of the survey strategy will be determined taking into account the nature of the site and its environmental setting. Expansion of the survey area or an increase in the intensity of the survey will be responsive to the probability that similar or related site types do exist within the North Lease Area.
5. If an "unexpected" site is found during survey of Zones II, III or IV, and no change in survey strategy is proposed, P&M will provide notice of this decision to OSM.

VIII. RESOURCES DISCOVERED DURING MINING OPERATIONS

A. In the event previously unknown and/or unidentified historic or archeological sites are discovered during mining and related earth disturbing activities on McKinley Mine lands, P&M will immediately initiate compliance with the provisions of the paragraph entitled "Resources Discovered During Mining Operations" on page 3 of Attachment A to the MOA.

B. The final report(s) covering the field survey of the North Lease Area will identify areas, if any are found, where unknown historic or archeological sites may be discovered during earth disturbing activities. If any such areas are identified, the report(s) will identify appropriate measures — consistent with this Plan — to provide for the identification of significant sites and their proper treatment.

C. Should a "common" site representing a class of sites/site types which has been afforded treatment under the provisions of this Plan be found during earth disturbing activities, it may be destroyed without further consideration. The IAC will provide P&M with criteria defining these classes as part of the Treatment Program. Provided, however, that if the site is found to contain human burials, it will be treated in accordance with Section X below.

D. Should an "unexpected" site, or a "common" site representing a class of sites/site types which was not afforded treatment under the provisions of this Plan be found during earth disturbing activities, its treatment will be determined in accordance with the provisions of this Plan (as amplified by the descriptive, analytic and synthetic reports prepared in accordance with Section XII - Dissemination of Information).

IX. MONITORING

A. **Quality Control:** To ensure proper implementation of this Plan, all field work will be monitored by the IAC who will conduct timely inspections of work in progress. The IAC will prepare or approve the descriptive, analytical and synthetic reports described in Section XII - Dissemination of Information.

B. **External Review:** In accordance with the provisions of paragraph 8 of the Plan Standards, P&M will:

1. Provide OSM with an anticipated field schedule for distribution to all parties to the MOA at least 14 days prior to initiation of survey activities.
2. Cooperate with parties to the MOA to facilitate field inspections (such inspections to be coordinated with the IAC).
3. As discussed in Section IV - Evaluation of Significance and Section V - Treatment of Sites, P&M will provide OSM and all other parties to the MOA with the evaluations of significance for all sites discovered during the survey and the proposed Treatment Program at least 20 days prior to initiation of the program.
4. As discussed in Section VI - Modifications, P&M will provide OSM and all other parties to the MOA with notice of any Plan modifications resulting in reduced field work at least 10 days prior to implementation of such modification.

X. BURIALS

A. **Navajo Burials:** Based on prior ethnographic work and extensive consultation with representatives of the Navajo Nation, it is believed that all Navajo burials have been identified and removed from the North Lease Area. Should any be discovered during survey or treatment field work conducted under this Plan, or during subsequent land disturbing activities, the Fort Defiance Chapter will be notified immediately and the burial(s) will be treated in accordance with the Chapter's directions.

B. **Anasazi and Earlier Burials:** If any such burials are discovered during implementation of this Plan or during subsequent land disturbing activities, the burial(s) will be treated in accordance with the Secretary of the Interior's "Guidelines for the Disposition of Archeological and Historical Human Remains."

XI. CURATION OF ARTIFACTS

A. All artifacts recovered under this Plan will be retained by the archeological contractor conducting the field work for a sufficient period of time to permit proper analysis and testing as defined in the survey and treatment programs. The archeological contractor will be fully responsible for proper curation while in his/her possession.

B. With the permission of the Navajo Nation, all Anasazi and other non-Navajo artifacts recovered under this Plan will be curated by a qualified institution in a manner consistent with the requirements of the Archeological and Historic Preservation Act of 1979 and with the Institutional Standards of the Society of Professional Archeologists. Detailed disposition plans will be developed by the IAC in consultation with the Navajo Nation and the archeological contractor.

C. Disposition of Navajo artifacts recovered under this Plan will be determined by P&M in consultation with the Navajo Nation. Artifacts desired by the Navajo Nation, the Fort Defiance Chapter, or by Navajo families or other groups will be delivered to them after analysis and testing is complete.

D. Artifacts recovered from lands owned by P&M may be curated, discarded or donated to an appropriate repository by P&M after completion of analysis and testing.

E. After completion of analysis and testing, artifacts not otherwise provided for may be curated or discarded by the archeological contractor.

XII. DISSEMINATION OF INFORMATION

A. **Survey Data:** Standard Laboratory of Anthropology, Museum of New Mexico, site record forms will be used for recording all sites. Ancillary records as discussed in Appendix V (Survey Design) will also be maintained. Copies of all site records and maps will be submitted by the archeological contractor to P&M within 7 days after completion of survey field work. A final descriptive report of the survey will be produced or approved by the IAC within 3 months after completion of all survey work.

B. **Treatment Data:** Final descriptive and analytic reports will be produced or approved by the IAC on all data recovery activities. (Specifications and timetables for these reports will be detailed in the Treatment Program prepared in accordance with Section V.)

C. **Final Report:** The IAC will produce or approve a final report synthesizing the information obtained from implementation of this Plan within one year after completion of all work.

D. **Distribution and Availability:**

1. **Site Records and Maps:** Copies of these materials will be provided to the Navajo Nation; the Laboratory of Anthropology, Museum of New Mexico; and the New Mexico State Historic Preservation Officer.

2. **Descriptive, Analytic and Synthetic Reports:** Copies of these reports will be provided to the Navajo Nation; OSM; the Laboratory of Anthropology, Museum of New Mexico; the Chaco Center; the Advisory Council on Historic Preservation; the Interagency Resource Protection Service, National Park Service; and the New Mexico State Historic Preservation Officer.

3. Availability of Information: P&M, through the IAC, will make available all primary and secondary data developed under this Plan for inspection by any party to the MOA.

APPENDIX 1

THE MEMORANDUM OF AGREEMENT
(MOA)

APPENDIX I

THE MEMORANDUM OF AGREEMENT
(MOA)

Advisory
Council On
Historic
Preservation

1522 K Street, NW
Washington, DC 20005

RECEIVED

AMENDMENT
TO
MEMORANDUM OF AGREEMENT

WHEREAS, the United States Geological Survey, the New Mexico State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation (Council) executed a Memorandum of Agreement on May 9, 1978, for the approval of a supplemental mining plan to facilitate development of energy resources on certain Navajo trust and allotted lands (United States Mining Leases Nos. NM 057349, NM 057348, NM 0554844 and NM 065460) constituting a part of the McKinley Mine in the State of New Mexico; and,

WHEREAS, the Memorandum of Agreement of May 9, 1978, was amended on December 21, 1978; and,

WHEREAS, in that portion of the McKinley Mine covered by the Memorandum of Agreement of May 9, 1978, the Pittsburg and Midway Coal Mining Company has completed all fieldwork required under the Agreement; and,

WHEREAS, the Office of Surface Mining, U.S. Department of the Interior (OSM), has pending a permanent mining program permit application for the entire McKinley Mine; and,

WHEREAS, OSM has determined that approval of the permanent mining program application, and consequent mining, may have adverse effects on historic properties not covered by the Memorandum of Agreement of May 9, 1978; and,

WHEREAS, pursuant to 36 CFR Section 800.6(c)(4) of the Council's regulations, OSM has now requested an amendment to the Memorandum of Agreement; and,

WHEREAS, the Minerals Management Service, U.S. Department of the Interior (formerly U.S. Geological Survey), has concurred in OSM's request; and,

WHEREAS, the Bureau of Indian Affairs, U.S. Department of the Interior (BIA), and the Bureau of Land Management, U.S. Department of the Interior (BLM), have jurisdiction over certain lands within the McKinley Mine, and have requested the opportunity to participate in the consultation process; and,

WHEREAS, the Minerals Management Service, BIA, and BLM have requested that OSM serve as lead agency for the Department of the Interior in the consultation process; and,

Advisory
Council On
Historic
Preservation

1522 K Street, NW
Washington, DC 20005

RECEIVED
JUN [illegible]

AMENDMENT
TO
MEMORANDUM OF AGREEMENT

WHEREAS, the United States Geological Survey, the New Mexico State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation (Council) executed a Memorandum of Agreement on May 9, 1978, for the approval of a supplemental mining plan to facilitate development of energy resources on certain Navajo trust and allotted lands (United States Mining Leases Nos. NM 057349, NM 057348, NM 0554844 and NM 065466) constituting a part of the McKinley Mine in the State of New Mexico; and,

WHEREAS, the Memorandum of Agreement of May 9, 1978, was amended on December 21, 1978; and,

WHEREAS, in that portion of the McKinley Mine covered by the Memorandum of Agreement of May 9, 1978, the Pittsburg and Midway Coal Mining Company has completed all fieldwork required under the Agreement; and,

WHEREAS, the Office of Surface Mining, U.S. Department of the Interior (OSM), has pending a permanent mining program permit application for the entire McKinley Mine; and,

WHEREAS, OSM has determined that approval of the permanent mining program application, and consequent mining, may have adverse effects on historic properties not covered by the Memorandum of Agreement of May 9, 1978; and,

WHEREAS, pursuant to 36 CFR Section 800.6(c)(4) of the Council's regulations, OSM has now requested an amendment to the Memorandum of Agreement; and,

WHEREAS, the Minerals Management Service, U.S. Department of the Interior (formerly U.S. Geological Survey), has concurred in OSM's request; and,

WHEREAS, the Bureau of Indian Affairs, U.S. Department of the Interior (BIA), and the Bureau of Land Management, U.S. Department of the Interior (BLM), have jurisdiction over certain lands within the McKinley Mine, and have requested the opportunity to participate in the consultation process; and,

WHEREAS, the Minerals Management Service, BIA, and BLM have requested that OSM serve as lead agency for the Department of the Interior in the consultation process; and,

WHEREAS, pursuant to Section 800.6 of the Council's regulations, representatives of the Council, OSM, and the New Mexico SHPO have consulted and reviewed the proposed amendment to consider alternatives to avoid or satisfactorily mitigate adverse effects; and,

WHEREAS, the Navajo Nation, which may assume jurisdiction over mining activities on its reservation lands within the McKinley Mine, the Energy and Minerals Department, State of New Mexico, which has pending a permanent mining program permit application for the entire McKinley Mine identical to that pending before OSM, and the Pittsburg and Midway Coal Mining Company were invited and participated in the consultation process;

NOW, THEREFORE, it is mutually agreed that the undertaking will be implemented in accordance with the following stipulations, superceding in its entirety the Memorandum of Agreement dated May 9, 1978 and amended December 21, 1978.

Stipulations

OSM will insure that the following measures are carried out.

1. The development of a single, comprehensive plan for the protection of historic and archeological properties which may be affected by the development of coal resources on McKinley Mine lands will be undertaken as the most efficient means of satisfying all applicable requirements for the protection of properties included in or eligible for inclusion in the National Register of Historic Places and expediting the development of coal resources.

2. The comprehensive plan will be developed and implemented in accordance with the attached proposal "A Program for the Protection of Historic and Archeological Properties at the McKinley Mine" (Attachment 1) satisfactorily avoiding or mitigating any adverse effects on properties included in or eligible for inclusion in the National Register of Historic Places.

3. Implementation of the attached proposal "A Program for the Protection of Historic and Archeological Properties at the McKinley Mine" will satisfy the requirements of Section 106 and related laws and regulations for the protection of properties included in or eligible for inclusion in the National Register of Historic Places for the purposes of compliance with the authorities administered by each of the parties to this Amendment as related to future development of coal resources at the McKinley Mine.

4. The parties to this Agreement may review implementation of the program from time to time to determine the appropriateness of using similar programs in other surface mining projects; execution of this Agreement will not, however, be held to establish a precedent for the use of similar programs in other projects.

Robert Garvey April (date) 26, 198
Executive Director
Advisory Council on Historic Preservation

(date) 4/26/8
Office of Surface Mining
U.S. Department of the Interior

(date) 7/8/
Bureau of Indian Affairs
U.S. Department of the Interior

Wm D Bettenberg (date) 4/27/8
Minerals Management Service
U.S. Department of the Interior

James E Parker (date) 4-28-8
Bureau of Land Management
U.S. Department of the Interior

(date)
New Mexico Historic Preservation Officer

Alexander Aldrich (date) July 16, 1982
Chairman
Advisory Council on Historic Preservation

Concur:

____________________ (date)
Navajo Nation

____________________ (date)
Energy and Minerals Department
State of New Mexico

May
7 ~~[illegible]~~ 1982 (date)
Pittsburg and Midway Coal Mining Company

A PROGRAM FOR THE PROTECTION OF HISTORIC AND ARCHEOLOGICAL RESOURCES AT THE MCKINLEY MINE

ttsburg and Midway Coal Mining Company Responsibilities.

The Pittsburg and Midway Coal Mining Company (P & M) will prepare a "Cultural Resource Plan - McKinley Mine" (hereinafter the "Plan") for the protection of historic and archeological resources located on McKinley Mine lands. The Plan will set forth the specifications to govern all historic and archeological work to be undertaken:

a. within the North Lease Area as marked on Attachment A (McKinley Mine Map);

b. within the entire McKinley Mine area with respect to historic and archeological resources discovered during mining and related activities.

The Plan will meet the standards prescribed in Attachment B, "Cultural Resource Plan Standards - McKinley Mine." P & M will consult with the Navajo Nation, the Bureau of Indian Affairs, the Office of Surface Mining and the New Mexico State Historic Preservation Officer in the development of the Plan.

P & M will submit its Plan to the Office of Surface Mining (OSM), U.S. Department of the Interior, for approval. Prior to, or simultaneously with, this submission, P & M will provide a copy of its proposed Plan to an official designated by each of the following:

a. the Bureau of Indian Affairs, U.S. Department of the Interior;

b. the Minerals Management Service, U.S. Department of the Interior;

c. the Bureau of Land Management, U.S. Department of the Interior;

d. the Navajo Nation;

e. the New Mexico State Historic Preservation Officer;

f. the Energy and Minerals Department, State of New Mexico.

In addition, P & M will provide the Advisory Council on Historic Preservation with a copy of the Plan for information purposes.

Upon approval of its Plan by OSM, P & M will carry out all historic and archeological work in accordance with the specifications of the approved Plan.

To enable OSM to properly monitor P & M's implementation of the approved Plan, P & M will provide OSM with periodic reports on its actions taken pursuant to the Plan. The frequency and scope of such reports shall be specified in the Plan.

Office of Surface Mining Responsibilities.

1. OSM will review P & M's proposed Plan within 35 days after receipt of the Plan to determine whether it meets the standards prescribed in Attachment B. In its review, OSM shall take into account the comments, if any, of the parties listed in subparagraphs 2a-f. Unless OSM determines that P & M's proposed Plan does not meet the standards of Attachment B, OSM shall approve the Plan as submitted by the conclusion of the 35 days review period.

2. OSM shall monitor P & M's implementation of the approved Plan through its review of P & M's periodic reports and such other means as OSM deems appropriate, including field inspections by OSM personnel. Upon approval of the Plan, OSM shall ensure that no land disturbing activities not otherwise approved are undertaken by P & M unless the proposed work area has been reviewed in accordance with the Plan.

Other Parties Responsibilities.

1. The Navajo Nation, the Bureau of Indian Affairs and the State Historic Preservation Officer shall make relevant information available to P & M to assist in the development of the Plan.

2. Within 21 days after receipt of P & M's proposed Plan submitted under paragraph 2, the parties listed in subparagraphs 2a-f shall provide their comments, if any, to OSM as to whether the proposed Plan meets the standards of Attachment B.

3. Upon approval of the Plan and assuming other legal requirements have been met, the required Federal and Navajo Tribal permits will be issued for the conduct of field work.

Conflict Resolution.

1. In the event that OSM and P & M disagree as to:

   a. whether P & M's proposed Plan as submitted under paragraph 2 meets the standards of Attachment B;

   b. whether P & M's implementing actions meet the specifications of the approved Plan;

   c. changes to the proposed Plan which OSM asserts are necessary to meet the standards of Attachment B; or

   d. changes in implementing actions which OSM asserts are necessary to meet the specifications of the approved Plan;

   upon receipt of written notice of disagreement from P & M, OSM shall immediately refer the matter to the Advisory Council on Historic Preservation (Council) for its comments.

2. The Council shall provide its comments to OSM within 21 days after receipt of OSM's request. The Council's comments shall include findings of fact and recommendations for appropriate action.

3. Taking into account the Council's comments, OSM shall notify P & M of its final decision on the matter within 5 working days after receipt of the Council's comments.

Model Validity.

1. The results of testing the validity of the model pursuant to subparagraph 2.f.(5) of Attachment B will be evaluated by OSM and BIA to determine:

   a. if the model is sufficient to accomplish the goals of the Plan, or

   b. if the model is not sufficient but can be modified through refinement of the model which may then result in additional testing and evaluation of the results as above, or

   c. if the model is not sufficient to accomplish the goals of the Plan and an intensive 100% inventory of the area to be disturbed by mining related activities shall be required.

2. If OSM and BIA cannot agree upon the validity of the predictive model within 20 days after the results of the testing have been received by the two agencies, position papers shall be forwarded to the Departmental Consulting Archeologist for the Department of the Interior. The Departmental Consulting Archeologist will provide OSM and BIA with comments within 10 days after receipt of the position papers. OSM shall take into account the comments of the Departmental Consulting Archeologist in making a final decision in the matter.

Resources Discovered During Mining Operations.

In accordance with Section 4 of the Archeological and Historic Preservation Act (16 U.S.C. 469a) and the requirements of 36 C.F.R. 800.7, if additional historic or archeological properties are discovered during mining operations, P & M will immediately notify the Secretary of the Interior through OSM. Upon receipt of such notice from P & M, OSM shall determine what measures are appropriate (consistent with the standards of Attachment B and the approved Plan) for the treatment of the newly discovered properties. OSM shall advise P & M within 48 hours of the action it proposes to undertake. In the interim period, P & M will take whatever steps are necessary to ensure that such properties are not destroyed by mining operations. Appropriate field work, if any, may include, but is not limited to, additional field work agreed to by P & M or action by the Secretary of the Interior pursuant to the provisions of the Archeological and Historic Preservation Act.

ATTACHMENT B

CULTURAL RESOURCE PLAN STANDARDS - MCKINLEY MINE

Based on existing data on the history and prehistory of the San Juan Basin, the Black Creek Drainage and the Rio Puerco Basin; existing data on the historic and archeological resources of the North and South Lease Areas of the McKinley Mine (including "An Overview of Prehistory in the McKinley Mine Area" by Linda S. Cordell); and mine plan and other available environmental data which provides a sufficient data base to achieve the objectives of Attachment 1 (Overview Objectives), P & M will develop a Plan detailing the specific requirements for a survey of the North Lease Area of the McKinley Mine, for evaluating the significance of historic and archeological resources located by the survey and for the treatment to mitigate the adverse effects on such resources. A predictive modelling technique will be used to develop the survey specifications for the North Lease Area. This technique will be flexible enough to take into account potential differences between the North and South Lease Areas of the McKinley Mine. The Plan shall be developed by or under the supervision of a qualified professional meeting one or more of the standards set forth in "Appendix C - Professional Qualifications" (42 Federal Register 5382, January 28, 1977). The Plan will cover the following:

1. Area Encompassed.

   The McKinley Mine is divided into North and South Lease Areas. The Plan's specifications for field work will cover the North Lease Area as identified in Attachment A (McKinley Mine Map). The Plan's specifications for evaluation and treatment of sites will also apply to any resources discovered during mining operations in the South Lease Area where all required field work has already been completed.

2. Survey.

   a. All known historic and archeological sites within the South Lease Area and other appropriate areas within the San Juan Basin, the Black Creek Drainage and the Rio Puerco Basin will be classified by type.

   b. All known historic and archeological sites within the South Lease Area and other appropriate areas within the San Juan Basin, the Black Creek Drainage and the Rio Puerco Basin will be classified based on their known or potential value for:

      (1) archeological research on the history or prehistory of the San Juan Basin, the Black Creek Drainage or the Rio Puerco Basin;

      (2) socio-cultural value related to the history of the San Juan Basin, the Black Creek Drainage or the Rio Puerco Basin;

(3) interpretation to the public of the history or prehistory of the San Juan Basin, the Black Creek Drainage or the Rio Puerco Basin; and

(4) continuing or adaptive re-use.

c. Based on existing data the types of not-yet-known sites which are likely to exist within the undisturbed portion of the North Lease Area will be predicted.

d. Based on existing data the types of not-yet-known sites which are likely to contribute important new or important corrobative knowledge to the existing data base on the history or prehistory of the San Juan Basin, the Black Creek Drainage or the Rio Puerco Basin will be identified.

e. Based on existing historic and archeological data, and existing environmental data (including but not limited to information on topography, hydrology, soils and geology), a predictive model will be developed which will identify those subareas within the undisturbed portion of the North Lease Area which are likely to contain not-yet-known sites.

f. Based on the predictions under paragraph 'e', those subareas within the undisturbed portion of the North Lease Area requiring further study to identify historic and archeological sites will be identified with the understanding that:

   (1) those subareas that are likely to contain types of sites identified under paragraph 'd' will be intensively surveyed with the appropriate methodology;

   (2) those subareas that are not likely to contain the types of sites identified under paragraph 'd' or which will not be disturbed by mining or related activities need not be surveyed;

   (3) those subareas where insufficient information exists to support predictions under paragraphs 'd' or 'e' (if any), will be identified and mechanisms to obtain the necessary data to support a prediction will be specified. This may include on-the-ground surveys which need not exceed "reconnaissance" level standards. (See subparagraph 12(d) and 36 C.F.R. 66, Appendix B).

   (4) the method of survey to be specified will be responsive to surface conditions (e.g., where the surface is obscured, identification may include test pits in likely areas and where the surface is not obscured, identification may be limited to field inspection.);

(5) mechanisms to test the validity of the predictive model will be specified, which shall include on-the-ground testing of sample areas identified under subparagraphs (2) and (3) above; and

(6) mechanisms to identify cultural or religious areas of significance to the Navajo people will be specified (this may be limited to a review of existing ethnographic data or it may include, if necessary, additional ethnographic study as determined in consultation with the Navajo Nation and the Fort Defiance Chapter thereof.

g. In accordance with the specifications developed under paragraph 'f', the necessary field survey will be conducted by or under the supervision of a qualified professional. (See Appendix C - Professional Qualifications as cited above).

3. Evaluation.

Sites identified through the survey will be classified by type and evaluated for significance against the following criteria:

a. is the site likely to contribute important new or important corroborative knowledge on the history or prehistory of the San Juan Basin, the Black Creek Drainage or the Rio Puerco Basin sufficient to qualify it for inclusion in the National Register of Historic Places;

b. does the site meet National Register of Historic Places' criteria specified in 36 C.F.R. 60.4(a) - (c);

c. does the site have potential value for public interpretation of the history or prehistory of the San Juan Basin, the Black Creek Drainage or the Rio Puerco Basin;

d. does the site have potential for continuing or adaptive re-use; and

e. does the site possess cultural or religious value to Native Americans or other social groups.

4. Treatment of Sites.

Treatment for each identified site shall be determined by the potential value of the site as determined in accordance with paragraph '3' above, taking into account the nature of the disturbance to the site from P & M's mining and related activities and the socio-economic costs and benefits which would result from implementation of the proposed treatment. Cost factors shall include but not be limited to direct monetary expenditures, indirect economic costs resulting from time delays and socio-economic costs related to the production and supply of coal from the McKinley Mine. The selected treatment must be

justifiable in terms of the predicted value of the site, the projected effect of mining and related activities on the value of the site, and the costs to be incurred to undertake the treatment.

- Selection of treatment shall take into account the desirability and feasibility of preserving the site in place. For properties of archeological value, selection of treatment shall take into account -- in numerical terms and in terms of quality and condition -- the relationship of the site to the same or similar types of sites within the San Juan Basin, the Black Creek Drainage and the Rio Puerco Basin.

Acceptable treatments include, but are not limited to:

a. avoidance and preservation of the site in place without further action;

b. recording and relocation of the site;

c. recording and demolition of the site;

d. consistent with the research objectives established in the Plan, archeological data recovery, including data recovery from representative examples of site types (e.g., where an adequate number of the same or similar type of site is known to exist or will be affected); and

e. demolition of the site without protective action.

The selected treatment will be carried out by or under the supervision of a qualified professional (See Appendix C - Professional Qualifications as cited above).

5. Modification.

Plan specifications will provide for a mechanism to modify Plan strategies and requirements as a result of information obtained from the actual field work. Depending upon the actual characteristics of the specific site as revealed by field work, the actual survey of treatment may be more or less comprehensive than proposed.

6. Unanticipated Property Types or Values.

Plan specifications will provide a mechanism for responding to property types which are not predicted and/or unexpected values discovered during field work.

7. Properties Discovered During Land Disturbing Activities.

In the event previously unidentified historic or archeological properties are discovered during mining operations or related activities, appropriate treatment will be determined in accordance with these standards and the approved Plan.

8. Monitoring.

Plan specifications will establish a reporting system to provide information to the Office of Surface Mining sufficient to ensure that P & M is implementing the Plan and that the Plan is working. Elements of the monitoring program may include the following:

a. On-site field inspections by any party to the Amended Memorandum of Agreement for the McKinley Mine.

b. An opportunity for any party to the Amended Memorandum of Agreement to review and comment to the Office of Surface Mining on P & M's reports on activities implementing paragraphs 3, 4 and 5 (to the extent that less comprehensive work is proposed under paragraph 5).

9. Burials.

While all known burials on McKinley Mine lands have already been properly treated, Plan specifications will provide a mechanism for treating human burials which shall generally include notice to the Office of Surface Mining, the Bureau of Indian Affairs and the Navajo Nation; coordination with any surviving related groups; appropriate recording, study and relocation when disturbance is unavoidable; and compliance with the applicable laws of the Navajo Nation and the State of New Mexico.

10. Curation of Artifacts.

Plan specifications will provide for the curation of archeological materials recovered under the Plan, including provisions for the retention by the archeological contractor for a sufficient period of time to permit proper professional evaluation and subsequent return of the materials to the owner of the land from which the materials were removed. With respect to Federal and Indian lands, Plan specifications will ensure satisfaction of the requirements of the Archeological Resources Protection Act of 1979.

11. Dissemination of Information.

Plan specifications will provide a mechanism for the appropriate management, storage and dissemination of reports and other primary and secondary data developed under the Plan, including a final report on the archeological work conducted at the McKinley Mine.

12. Reference Guidelines.

In addition to the existing data described herein, the Plan shall be developed taking into consideration the following:

a. New Mexico State Historic Preservation Plan,

b. "The Archeological Survey: Methods and Uses" (HCRS 1978),

c. "The Resource Protection Planning Process" (HCRS 1980),

d. "Treatment of Archeological Properties" (ACHP 1980), and

e. Navajo Tribal Law.

ATTACHMENT 1

OVERVIEW OBJECTIVES

1. To set forth what is known about the history and prehistory of the McKinley Mine area.

2. To describe and evaluate the quality of historical, archeological and other surveys and studies in the McKinley Mine area upon which knowledge of the area's history, prehistory and its historic and cultural resources is based.

3. To identify organizations, professionals, local governments, social or ethnic groups and others with interests or concerns about historic and cultural resources in the McKinley Mine area and to establish appropriate means for obtaining their views and comments.

4. To classify, describe and determine the locations of known historic and cultural resources, including those included in or eligible for inclusion in the National Register of Historic Places, those recorded in State and local inventories, publications and other data sources.

5. To identify subareas within the McKinley Mine area where historic, archeological, ethnographic, geographic, environmental, remote-sensing or other data sources indicate that not-yet-known historic or cultural resources are likely to exist.

6. To classify known historic and cultural resources, and those likely to exist, according to types based on their potential value for important archeological research on the history and prehistory of the San Juan Basin, their known or potential socio-cultural value, their potential for public interpretation and their potential for continuing or adaptive re-use.

7. To propose appropriate strategies and specifications for locating predicted types of historic and cultural resources, taking into account the nature and attributes of the type of resource and the conditions of the ground surface.

8. To assess the significance of known and predicted historic and cultural properties and property types, using the National Register of Historic Places' Criteria for Evaluation (36 C.F.R. 60.6), the State of New Mexico's Historic Preservation Plan and existing literature to provide general guidelines.

9. To develop strategies and specifications for the appropriate management and treatment of the historic and cultural resources located within the boundaries of the McKinley Mine.

APPENDIX B

RESEARCH QUESTIONS

APPENDIX II

RESEARCH QUESTIONS

RESEARCH QUESTIONS

I. Introduction

Over the last decade, two fundamental principles became apparent to practitioners of archeology. First, the profession recognized the need to adhere to scientific methods in conducting research. This need requires formulation of explicit research questions and hypotheses prior to undertaking research.

While the preparation of a scientifically sound research design does not guarantee the success of a particular effort, it does maximize both the probability of success and the efficiency of work efforts. Focusing attention on important research questions prevents the diffusion of interest in so many directions that no questions are answered well. Such a focus also requires that the investigators be thoroughly familiar with the theories, classes of data, and analytical strategies that are needed for an effective research program.

Second, recognizing that archeological research undertaken with governmental funds or under governmental laws and regulations must be justifiable in the public interest, the profession recognized the need to evaluate research priorities with respect to their relevance to today's society.

Research that will contribute to understanding the relationships between societies and environments has the potential to help us cope with present and probable future social and environmental conditions. Such research is clearly in the public interest, even if its contribution is relatively small or indirect. Research that has no such relevance can seldom be construed to be in the public interest.

The selection of research questions for the Cultural Resource Plan - McKinley Mine attends to both these principles. The Plan itself sets forth the scientific processes necessary for the conduct of effective resource management planning and archeological research.

II. Development of Research Questions

The development of the research questions for the Plan was based on a throrough analysis of existing information on the history and prehistory of the San Juan Basin and the Black Creek and Rio Puerco Drainages.

Federal, State and private agencies have provided financial support for the preparation of "overviews" for the region so that important research questions could be identified. This region has probably been the focus of more overviews than any other area in the United States. Linda Cordell (1982) has prepared an overview specifically for the Mine. The National Park Service supported the preparation of an overview for the San Juan Basin (Plog and Wait in press) and has already formulated a series of specific recommendations concerning the significance of sites based on this effort (National Park Service, 1980). Cordell (1979) has also prepared an overview for the upper Rio Grande Drainage which contains discussions pertinent to the Mine area. Tainter and Gillio (1980) authored an overview for an area from the Mine into the Rio Puerco

Drainage to the south. Plog (1981) has written an overview for the Little Colorado drainage of Arizona which lies to the southwest of the Mine. Stuart and Gauthier (1980) prepared an overview for the entire State of New Mexico. Fehr (1982) has prepared an overview for the Black Creek Drainage to the west of the Mine.

Correlation of the information contained in these overviews with the data base (see Appendix III, The Data Base) produced clear evidence that the vast majority of prehistoric sites to be found at the McKinley Mine would date from the Pueblo II and Pueblo III time periods. For the historic period, the evidence is equally clear that the vast majority of sites will be associated with post - 1868 Navajo occupation of the area. Consequently, the research questions developed for the Plan are focused on those topics that can be addressed using data from such sites. It should be noted, however, that several of the research questions discussed below are also applicable to sites in the Basketmaker III through Pueblo IV time periods.

Given the limited likelihood of Paleo-indian, Archaic, Basketmaker II, Pueblo IV and V, and pre-1868 Navajo sites being located on Mine lands, research topics that could be usefully addressed by data from such sites were not developed. Appropriate research questions will be developed for sites from any of these time periods if evidence becomes available that sites possessing sufficient quality exist in sufficient quantity to justify such an effort.

III. The Prehistoric Period

For the prehistoric period a common focus in the overview documents is the appearance of politically and economically complex social systems among the Anasazi, the prehistoric Puebloan inhabitants of the area. In the Southwest generally, such systems are episodic in time and discontinuous in space. This pattern suggests that such systems, at least in arid environments such as the Southwest, do not prove viable. The majority of such systems date to the period between AD 1000 and AD 1450, although none endures for this entire period of time.

Recently, attention has been directed to the implications of the apparent fragility of such systems on a world-wide basis. Adams (1978), Stuart (in press) and Plog (in press) have identified a "cyclical" dynamic between societies based on "power and stability" and those based on "resiliency and efficiency." The former, the politically and economically complex societies, seek to adjust to their environment through sustained growth, usually managed by a hierarchy of decision makers. The latter, societies of small homestead or farmstead producing units, seek to adjust to their environment by continual responsive changes. While "power based" societies are episodic, "resilient" forms appear to exist almost continuously. Usually this pattern holds true even when the members of such groups are dominated by nearby complex groups.

The existence of such a dynamic has important implications for our own society, especially for settlements and social systems in arid areas. Clearly, our own society is based on power and stability principles. On the human continuum, our own history of placing large cities with complex political and economic organizations in such areas is a very short one - far shorter than the periods during which some prehistoric analogs flourished.

By understanding the manner in which earlier "power-based" societies grew and especially by understanding the factors that led to their demise, we may be able to learn things that will help us to survive in areas where our predecessors did not.

The San Juan Basin was the homeland of what was probably the most complex of prehistoric southwestern societies - the Chacoan system. The Chacoan System, centered in Chaco Canyon, flourished between about AD 1000 and AD 1500. At its peak, Chacoan towns were inhabited by "elite" groups who had access to luxury goods unavailable to commoners. The towns were linked by an impressive series of roads to "outliers," rural centers from which a vast hinterland area was administered. (See Cordell in press: 108-117, 125-127, 131-133; Stuart and Gauthier, 1981: 40-43, 114-117; Tainter and Gillio 1980: 16-19, 60-66, 70-72, 77-83, 100-114 for more detailed discussions of the Chacoan system and related issues).

In recent years much effort has been invested in understanding the Chacoan system as it is manifest in towns, roads and outliers (see citations above). However, little is known of the specific mechanisms that tied resilient groups of hinterland areas into that system.

The McKinley Mine area is peripheral to but cetainly not isolated from the Chacoan system. As such it provides an excellent opportunity to explore the relationship between the power center and the hinterland. In the process of such an exploration, one can consider the larger issues identified earlier by addressing detailed questions about the social and cultural patterns of the Mine area. Specific questions of relevance to such a study are the following:

A. Settlement Pattern

Archeological studies of the South Lease Area of the McKinley Mine suggest that prehistoric occupation of the Mine area occurred suddenly and was of short duration. Such a pattern is precisely what one would expect as a result of a purposeful effort on the part of the Chacoan peoples to colonize outlying areas. There is, however, evidence of pre-Chacoan occupation of nearby areas of the San Juan Basin.

Study of local settlement patterning could greatly increase our understanding of the initial occupation perods. Specific questions to be addressed include the following:

1. Were the earliest sites in the area sedentary or non-sedentary communities? If evidence of early non-sedentary communities with artifact inventories different from later sites were found, this analysis would strengthen the case for the replacment or absorption of local peoples by Chacoan colonists. Analyses would be required to evaluate the permanency of the earliest Anasazi habitation sites in the Mine area, probably including analyses of deposits in caves or rock shelters.

2. Were early pithouse sites replaced by Chacoan - associated pueblos? The transition from living in pithouses to living in pueblos is a focal question in southwestern prehistory. If it could be shown that the transition in the McKinley Mine area was coincident with the appearance of Chacoan materials, then a social explanation of this transition would be suggested.

A careful comparison of the artifact inventories of a pithouse site and an early pueblo site would meet this need.

3. Were the Pueblo II and III settlement patterns of the area hierarchical? In general, the site size of resilient societies varies only slightly. Power-based societies, however, have hierarchical patterns of variation with settlement sizes falling into discrete categories. In addition, larger sites typically contain material items differing from those of smaller sites, "exotic" or "luxury" goods. If a hierarchical settlement pattern were demonstrated for the McKinley Mine area, the case for Chacoan domination would be strenghthened. A major portion of this analysis can be done with survey data. However, comparison of surface remains, or preferably excavated remains from a site with ten or more rooms, to remains from smaller sites would be needed.

Throughout most of prehistory, people lived in simple, usually temporary settlements of more or less the same size. The shift to a settlement pattern with permanent sites and sites of dramatically different sizes is a relatively recent occurrence. Since, as a species, we are adapted to a more nomadic existence and face-to-face interaction with a relatively small group of people, the question of the causes and consequences of this settlement change is an important one. Research focused on prehistoric occupation of the McKinley Mine area may shed light on this issue.

B. Subsistence

Archeological studies of the South Lease Area have generated a wealth of information concerning prehistoric subsistence practices, the strategies that prehistoric peoples used to obtain foodstuffs. These data provide a basis for beginning to resolve the question of how subsistence practices differed from site to site and time period to time period within the area. A major issue is how subsistence practices might have been effected by participation in the Chacoan system.

1. Were subsistence practices in the area simple or were they diverse and intensified? The subsistence practices of resilient societies are very different from those of power-based ones. In the case of resilient societies, subsistence practices change through time in response to environmental change, but are more or less the same from settlement to settlement, or among groups of settlements (consider hunting camps vs. seed-gathering camps). Thus, if a resilient pattern were characteristic of the area, one would anticipate that a comparison of floral and faunal remains from different sites would show little spatial variation from site to site or site-group to site-group for any single time period, but significant differences between sites of different time periods. Power-based societies generally depend on a stable set of highly specialized subsistence practices that vary considerably over space, but less so over time. Thus, were local peoples participating in the complex Chacoan system, one would anticipate that spatial variation during any one period might be great. Peoples living at the higher elevations of the North Lease Area, for example, might have been involved in acquiring more hunted and gathered resources than those living to the south. Similarly, evidence of water or soil control features

would evidence agricultural practices different from those recovered during study of the South Lease Area.

Diversity in subsistence practices, especially the replacement of groups dependent on hunting-gathering by agricultural peoples, is an important focus of archeological research. Throughout over 99 percent of human history, we lived as hunter-gatherers. Sociologically and physiologically we are still adapting to our new diet. Evidence generated in answering this research question would bear on this important general issue.

C. Trade and Exchange

The trading and exchange of foodstuffs and materials is a basic human behavior today and was equally important in prehistory. Because techniques for determining the "source" of foodstuffs have not been discovered, archeological analyses focus on artifacts, the chemical and physical characteristics of which provide evidence of the source of the item. Sourcing studies have become increasingly common in recent years as a means of mapping prehistoric exchange and trade networks.

1. **Did trade goods come predominantly from the Chacoan system or from other areas?** One means of assessing the extent to which prehistoric peoples who lived in the McKinley Mine area participated in the Chacoan system is by sourcing material items found on local sites. If all of the artifactual materials found on local sites prove to be of local origin, then the area must be thought of as one that was economically self-sustaining and peripheral to all nearby areas. If the majority of sourced items show Chacoan affiliation, then the case for domination of the area by the Chacoan system would be strengthened. If Chacoan and non-Chacoan trade goods are equally abundant, then it would appear that the local residents drew eclectically on nearby trade networks.

2. **Did the abundance of trade goods vary through time?** While the exchange of goods is characteristic of all human societies, exchange is generally more intense and more varied in space and time when a hinterland area is dominated by power-based groups. Spatial variation often takes the form of a great abundance of trade goods at a few, usually larger and centrally located sites. If sourcing studies indicated such a pattern, then evidence for centralized organization of trading relationships with other areas would be indicated. Temporal variation provides evidence of the periods of time during which local peoples were dominated by nearby power-based societies. Taken together, such data would provide evidence of the timing and extent of domination of the local area by nearby systems.

Trade and exchange relationships play a central role in modern theories concerning the origin of complex societies. Some archeologists argue that the managerial offices and institutions that form the core of such societies arose specifically to manage the increasingly complex trade networks that humans began to use as an adaptive mechanism. Other archeologists argue that these managerial offices arose in order to coordinate increasingly complex modes of agricultural production. Clearly, these theories are not mutually exclusive. Analyses of local data may shed light on this important general issue.

D. Abandonment

1. Why was the McKinley Mine area abandoned?

A careful analysis of the data obtained in answering the preceding questions will permit discussion of this one also. If environmental change was a major factor, subsistence remains from the latest sites in the area should differ dramatically from those of earlier sites and there should be corresponding evidence recovered from the same deposits of those environmental changes. If the collapse of the Chacoan system was a major factor, trade goods should decline during the terminal periods of occupation. Finally, there is a possibility that the area was not totally abandoned, that the peoples living there reverted to a more nomadic pattern that did not involve the construction of permanent dwelling sites. Should the latest sites in the area prove to be impermanent or ephemeral, this possibility would be supported.

IV. The Post-1868 Navajo Period

For the post-1868 period, the current situation is somewhat different from that for the Anasazi.

First, a substantial research document has been prepared describing important elements of this period in the area (Kelley 1982a), and another for a nearby area (Kelley 1982b). The goal of the research questions identified here is primarily to refine the already substantial understanding of the period provided by those studies. Two research questions are important to the effort.

1. **Were upland socioeconomic systems different from low-land ones?** Kelley has suggested that more favorable habitats may eventually have been dominated by wealthier Navajo families, "ricos". If so, one might anticipate that settlements in the upland area might have had larger hogans and a greater quantity and diversity of Anglo-manufactured goods. Much of the pertinent data will be recovered through survey and surface collection, although excavation data could prove pertinent. A "rico" site whose residents were still alive would provide additional potential for ethno-archeological research.

   The question of why and how wealth differentials arise is one of the oldest that has concerned social scientists. Evidence of wealth differentials in the local area would provide additional evidence bearing on this issue.

2. **What was the impact of a wage-labor economy on Navajo settlement patterns?** Kelley (1982a) and Boyer (in press) have discussed, in some detail, potential evidence of responses to a change in economic systems. Boyer suggests decreasing densities of sites in grazing areas in the later period, for example. Changes in the size and longevity of hogans is another expectation. The majority of such issues can be explored using survey data. However, excavation of sites dating to the period in question would clarify the effect of the change on material culture.

Many peoples in third world countries are currently undergoing the change that the Navajo experienced earlier. Consideration of this question in the North Lease Area could generate data that would allow social scientists working in third world countries to anticipate a variety of different responses to the advent of wage-labor.

V. References

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APPENDIX III

THE DATA BASE

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I. Data Sources

In accordance with the consultation requirements of Paragraph 1 of Attachment 1 to the Memorandum of Agreement, requests for additional data were made to the Navajo Nation, the Bureau of Indian Affairs, the Office of Surface Mining, the New Mexico State Historic Preservation Officer, the Museum of New Mexico, the New Mexico Laboratory of Anthropology, and the National Park Service.

Data used in formulating this plan include the following:

1. Overview documents prepared by Cordell (1979), Cordell (1982), Fehr (1982), Plog (1981), Plog and Wait (in press), Stuart and Gauthier (1981), and Tainter and Gillio (1980). These documents were used in formulating the research questions and in developing an initial understanding of the factors that might affect site distributions in the area.

2. The site file generated as a part of the San Juan Basin Regional Uranium Study (SJBRUS) was used to classify sites in the San Juan Basin by period and type.[1] The most specific version of the classification (Table III-1) was published by the National Park Service. These data have been used in designing the approaches to evaluation and treatment. Prior to the actual evaluation and treatment decisions, an updated matrix of this type will be obtained. Updated prehistoric site totals (Table III-2) and updated Navajo site totals (Table III-3) were requested from the National Park Service and were used in projecting expected numbers of sites for the North Lease Area. These tables also illustrate the manner in which new tables specific to particular evaluation and treatment decisions will be generated.

3. Data from the Office of Contract Archeology, University of New Mexico, study of the South Lease Area were used in estimating the number of sites likely to be found in the North Lease Area. These data are summarized in Table III-4. These data also served as the basis for defining site types for the area, lumping the large variety of types used by SJBRUS into a smaller number of categories to facilitate quantitative analyses.

4. Data from the Navajo Nation site files and those of the Museum of New Mexico Laboratory of Anthropology were used in evaluating the predictive model. These data are discussed subsequently.

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[1] For purposes of this document, the San Juan Basin is the area of the SJBRUS.

TABLE III-1: Classification of Known Sites in the San Juan Basin (NPS 1980).

	PALEO-INDIAN	PALEO TO ARCHAIC	ARCHAIC	ARCHAIC-BM II	BM II	BM II-BM III	BM III	BM III-PI	PUEBLO I
Habitation									
Undefined	0	0	3	0	0	0	48	8	19
Pueblo	1	0	11	1	7	0	212	38	610
Village	0	0	4	0	9	2	226	53	132
Hogan Cluster or Hogan	3	1	19	0	3	0	49	9	78
Pueblito	0	0	0	0	0	0	1	0	1
Fort or Defensive Retreat	0	0	0	0	0	0	0	0	1
Trading Post	0	0	0	0	0	0	0	0	0
Farm or Ranch	0	0	1	1	1	0	6	3	5
Other Historic House	0	0	0	0	0	0	0	1	0
Public Building	0	0	0	0	0	0	0	0	0
Campsite									
Farm Site	0	0	4	0	3	0	9	4	5
Processing	0	0	13	1	0	0	1	0	2
Hunting and Gathering	0	0	18	2	9	0	4	3	4
Animal Husbandry	0	0	4	0	0	0	0	1	2
Other	2	0	3	0	0	0	0	1	3
Undefined	0	1	32	0	2	0	8	4	2
Resource Extraction									
Undefined	0	0	0	0	0	0	0	0	0
Quarry	0	0	13	0	1	0	3	1	4
Kill	0	0	0	0	0	0	0	0	0
Gathering	0	0	0	0	0	0	0	0	1
Farming	0	0	0	0	0	0	0	0	2
Tool Making	0	0	10	0	3	0	0	1	2
Gathering, Processing	0	0	3	0	2	0	1	0	3
Mining	0	0	0	0	0	0	0	0	0
Hunting	0	0	5	0	0	0	0	1	0
Other	0	0	0	0	0	0	0	0	1
Ceremonial									
Shrine	0	0	1	0	0	0	1	0	5
Ritual Structure	0	0	0	0	0	0	0	0	0
Kiva	0	0	1	0	0	0	3	0	65
Great Kiva	0	0	0	0	0	0	1	0	3
Church	0	0	0	0	0	0	0	0	0
Burial (Multiple)	0	0	1	0	0	0	2	0	0
Burial (Single)	0	0	0	0	0	0	1	1	5
Other	0	0	0	0	0	0	0	0	0
Undefined	0	0	0	0	1	0	0	1	0

TABLE III-1: Classification of Known Sites in the San Juan Basin (NPS 1980). (Continued)

	PI-PII	PUEBLO II	PII-PIII	PUEBLO III	PIII-PIV	PUEBLO IV	PIV-PV	PUEBLO V	UNKNOWN ANASAZI
Habitation									
Undefined	3	14	3	10	2	1	0	2	6
Pueblo	138	2003	525	1523	108	30	7	37	690
Village	11	54	13	328	3	0	0	0	36
Hogan Cluster or Hogan	7	121	25	81	1	2	0	2	75
Pueblito	0	1	0	0	0	0	0	0	0
Fort or Defensive Retreat	0	1	1	17	2	0	0	1	0
Trading Post	0	0	0	0	0	0	0	0	0
Farm or Ranch	4	6	1	3	1	0	0	0	4
Other Historic House	0	3	3	6	0	0	0	5	4
Public Building	0	4	4	7	0	0	0	0	0
Campsite									
Farm Site	3	2	1	1	2	0	0	0	2
Processing	1	3	6	2	0	1	0	0	6
Hunting and Gathering	0	0	3	2	0	0	0	0	2
Animal Husbandry	0	4	2	2	1	0	0	1	3
Other	0	2	0	1	0	0	0	0	1
Undefined	1	16	8	5	0	0	0	2	14
Resource Extraction									
Undefined	0	0	1	0	0	0	0	0	0
Quarry	0	2	2	3	0	0	0	0	3
Kill	0	0	0	0	0	0	0	0	0
Gathering	0	1	0	0	0	0	0	0	0
Farming	0	0	0	3	0	0	0	0	0
Tool Making	0	2	0	2	0	0	0	1	1
Gathering, Processing	0	5	0	0	0	0	0	0	1
Mining	0	1	0	1	0	0	0	0	0
Hunting	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0
Ceremonial									
Shrine	2	10	3	21	0	0	0	1	6
Ritual Structure	0	1	0	3	0	0	0	0	0
Kiva	0	106	11	101	2	0	0	0	10
Great Kiva	3	8	4	5	0	0	0	0	1
Church	0	0	1	1	0	0	0	0	0
Burial (Multiple)	0	8	1	2	0	0	0	0	2
Burial (Single)	0	6	3	4	0	0	0	0	3
Other	0	0	1	2	0	0	0	0	0
Undefined	1	0	1	1	0	0	0	0	1

TABLE III-1: Classification of Known Sites in the San Juan Basin (NPS 1980). (Continued)

	PRIOR 1868 NAVAJO	1868-1950 NAVAJO	AFTER 1950 NAVAJO	UNKNOWN NAVAJO	UTE	SPANISH	ANGLO	UNKNOWN LITHIC	UNKNOWN CERAMIC	OTHER	UNKNOWN
Habitation											
Undefined	16	10	3	7	0	2	1	0	0	0	43
Pueblo	11	70	10	231	0	6	5	1	1	6	61
Village	24	5	1	17	0	3	2	1	0	0	39
Hogan Cluster or Hogan	227	777	162	1282	0	2	5	17	0	0	9
Pueblito	17	0	0	0	0	0	0	0	0	0	1
Fort or Defensive Retreat	1	0	0	1	0	0	0	0	0	0	0
Trading Post	0	0	0	0	0	0	2	0	0	0	0
Farm or Ranch	4	15	26	13	0	29	14	3	0	4	15
Other Historic House	3	16	19	12	0	15	18	1	0	11	35
Public Building	0	0	1	0	0	0	1	0	0	1	1
Campsite											
Farm Site	0	0	3	0	0	2	0	0	0	1	0
Processing	0	7	2	3	0	0	0	8	1	1	4
Hunting and Gathering	2	3	0	1	0	1	0	4	0	0	2
Animal Husbandry	4	53	45	51	0	22	1	4	0	7	16
Other	8	7	3	4	0	0	0	0	0	1	5
Undefined	20	45	25	38	0	16	0	13	1	1	25
Resource Extraction											
Undefined	0	0	0	0	0	0	0	0	0	0	0
Quarry	0	1	1	16	0	0	2	9	0	0	24
Kill	0	0	0	0	0	0	0	0	0	0	0
Gathering	0	0	0	2	0	0	0	0	0	0	0
Farming	0	0	1	1	0	1	0	0	0	1	0
Tool Making	0	0	0	1	0	0	0	23	0	0	7
Gathering, Processing	1	0	0	1	0	0	0	1	0	0	1
Mining	0	4	4	7	0	0	4	0	0	1	0
Hunting	0	0	0	0	0	0	0	0	0	0	0
Other	1	2	0	0	0	0	0	0	0	0	1
Ceremonial											
Shrine	2	10	3	41	0	0	0	0	0	0	10
Ritual Structure	0	4	1	4	0	0	0	0	0	0	1
Kiva	1	1	0	18	0	0	0	0	0	0	0
Great Kiva	0	0	0	2	0	0	0	0	0	0	1
Church	0	0	0	0	0	0	0	0	0	0	0
Burial (Multiple)	0	1	0	18	0	0	1	0	0	0	4
Burial (Single)	1	20	5	21	0	0	0	0	0	0	5
Other	0	1	1	4	0	0	0	0	0	0	3
Undefined	1	1	0	26	0	0	0	0	0	0	2

TABLE III-1: Classification of Known Sites in the San Juan Basin (NPS 1980). (Continued)

	PI AN LD E I OA - N	P AA LR EC OH A T I OC	A R C H A I C	A R C HB AM I C I - I	B M I I	BB MM I I I I - I	B M I I I	B M I I P I - I	P U E B L O I
Miscellaneous									
Other	0	0	3	0	0	0	1	0	2
Sweat Lodge	0	0	4	0	0	0	3	0	4
Petroglyph, Pictograph	0	0	3	0	1	0	15	0	79
Roads and Trails	0	0	2	0	0	0	3	0	19
Water Control	0	0	2	0	0	0	7	1	20
Manu. and Bus. Sites	0	0	0	0	0	0	0	0	0
Animal Husbandry	0	0	6	0	0	0	5	1	10
Alignments and Piles	0	0	10	0	1	0	20	0	31
Stone Enclosures	0	0	3	0	1	0	1	0	6
Storage	0	0	2	0	5	0	64	3	70
Undefined Artifact Scatter									
Lithic	12	0	534	14	40	4	28	12	8
Ceramic	2	0	30	1	2	0	99	9	91
Lithic and Ceramic	1	0	52	3	20	3	194	48	203
Hearths	1	0	93	4	10	2	57	12	34
Modern Refuse	1	0	12	1	1	0	4	3	6
Undefined Structure									
Coursed Stone	0	0	0	0	0	0	3	0	6
Concrete	0	0	0	0	0	0	0	0	0
Cinderblock	0	0	0	0	0	0	0	0	0
Adobe	0	0	0	0	0	0	1	0	3
Wood Frame	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	0	0	0	0	0
Jacal	0	0	0	0	2	0	13	5	8
Other	0	0	1	0	1	0	8	0	3
Defensive									
Fort or Defensive Retreat	0	0	0	0	0	0	0	0	0
Wall	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0
Unknown	1	0	2	0	0	0	7	1	2

TABLE III-1: Classification of Known Sites in the San Juan Basin (NPS 1980). (Continued)

	PP II -I	P U E B L O I I	PP II II -I	P U E B L O I I I	P IP I II -V	P U E B L O I V	P IP V -V	P U E B L O V	UA NN KA NS OA WZ NI
Miscellaneous									
Other	0	5	0	3	0	0	0	4	8
Sweat Lodge	0	7	2	2	0	0	0	0	16
Petroglyph, Pictograph	2	124	3	102	0	1	0	2	154
Roads and Trails	0	35	1	37	0	1	0	0	63
Water Control	2	53	4	34	0	1	0	0	41
Manu. and Bus. Sites	0	0	0	0	0	0	0	0	0
Animal Husbandry	1	16	3	10	0	0	0	18	13
Alignments and Piles	1	58	5	54	0	0	0	3	48
Stone Enclosures	0	8	6	14	0	0	0	0	11
Storage	1	76	4	54	2	0	0	0	47
Undefined Artifact Scatter									
Lithic	2	20	6	18	1	0	0	5	61
Ceramic	12	241	64	127	2	2	1	13	172
Lithic and Ceramic	34	340	51	196	6	12	0	11	253
Hearths	13	69	16	37	0	2	0	3	54
Modern Refuse	0	24	5	18	0	0	0	3	9
Undefined Structure									
Coursed Stone	1	12	8	23	0	1	0	0	13
Concrete	0	0	0	0	0	0	0	0	0
Cinderblock	0	0	0	0	0	0	0	0	0
Adobe	0	3	0	1	0	0	0	0	0
Wood Frame	0	0	0	0	0	0	0	0	0
Wood	0	0	0	0	0	0	0	0	0
Jacal	1	7	1	2	0	0	0	0	2
Other	0	5	0	5	0	0	0	0	5
Defensive									
Fort or Defensive Retreat	0	0	0	14	0	0	0	1	1
Wall	0	0	0	0	0	1	0	0	2
Building	0	1	0	0	0	0	0	0	2
Unknown	2	9	3	4	0	0	2	2	20

TABLE III-1: Classification of Known Sites in the San Juan Basin (NPS 1980). (Continued)

	PRIOR 1868 NAVAJO	1868-1950 NAVAJO	AFTER 1950 NAVAJO	UNKNOWN NAVAJO	UTE	SPANISH	ANGLO	UNKNOWN LITHIC	UNKNOWN CERAMIC	OTHER	UNKNOWN
Miscellaneous											
Other	2	25	8	24	0	1	1	5	0	0	23
Sweat Lodge	17	114	43	207	0	0	0	2	0	0	3
Petroglyph, Pictograph	14	50	4	257	1	18	7	1	0	2	82
Roads and Trails	0	4	0	96	0	4	1	0	0	0	45
Water Control	0	8	0	66	0	3	7	1	0	0	83
Manu. and Bus. Sites	0	0	0	1	0	2	0	0	0	0	0
Animal Husbandry	11	192	86	235	0	5	1	5	0	6	47
Alignments and Piles	3	55	10	192	0	9	1	3	2	0	119
Stone Enclosures	1	50	5	33	0	0	0	0	0	0	31
Storage	10	11	0	212	0	0	0	3	0	0	70
Undefined Artifact Scatter											
Lithic	9	42	33	51	0	10	3	479	3	1	193
Ceramic	39	46	8	99	0	3	1	5	12	1	50
Lithic and Ceramic	82	35	9	72	0	12	0	2	2	1	139
Hearths	15	31	6	106	0	8	2	35	0	0	212
Modern Refuse	8	54	22	20	0	1	8	9	0	3	49
Undefined Structure											
Coursed Stone	4	7	3	28	0	3	0	0	0	0	20
Concrete	0	0	0	0	0	0	0	0	0	0	0
Cinderblock	0	0	0	0	0	0	0	0	0	0	0
Adobe	0	0	0	0	0	0	0	0	0	0	1
Wood Frame	0	1	4	1	0	0	0	1	0	0	0
Wood	0	9	3	5	0	0	0	1	0	0	1
Jacal	4	1	0	1	0	1	0	0	0	0	1
Other	2	6	0	10	0	1	0	0	1	0	10
Defensive											
Fort or Defensive Retreat	2	1	0	1	0	0	0	0	0	0	0
Wall	2	0	0	2	0	0	0	0	0	0	3
Building	0	0	0	0	0	0	1	0	0	0	0
Unknown	4	5	2	31	0	1	0	1	0	0	37

TABLE III-3: Updated Navajo Site Totals

	Hogans	Sweat Lodges	Animal Husbandry	Other
Pre-1868 Navajo	254	20	15	2
1868-1950 Navajo	905	142	272	52
Post-1950 Navajo	232	64	150	4
Unknown Navajo	1,426	251	290	36
TOTAL	2,817	477	727	94

TABLE III-4: South Lease Area Sites

Anasazi Sites	
Ceramic Scatters	21
Small Structures (1-2 rooms)	12
Large Structures (3+ rooms)	14
Multiple Structures	3
Other	12
	62
Navajo Sites	
Hogans	111
Campsites/Corrals	60
Sweathouses	63
Other	13
	247

II. Projected Site Totals

Projected site totals for the North Lease Area were made based on the SJBRUS file and the South Lease survey. Assuming that the average density of sites per square mile in the North Lease Area is the same as that determined for the South, one would estimate a total of 218 sites (Table III-5).[2] If one takes into account the predictive model, which indicates that a more limited relative percentage of the North Lease Area is most likely to contain sites, one would anticipate about 144 sites. Based upon the SJBRUS file, the anticipated number of sites is 172 (Table III-6).[3]

The SJBRUS data suggest the possible presence of sites that were not found in the South Lease Area (Archaic, pre-1868 Navajo). The SJBRUS data do indicate, however, that Archaic sites are rare in the southwestern basin. Given that these sites were not located during survey of the South Lease Area and that local data are the better basis for estimation, the Plan strategy does not focus on these sites. However, should such sites be discovered, the appropriate re-evaluation mechanisms as specified in the Plan will be triggered.

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[2] This estimate may be derived by multiplying the average site density per square mile by the number of square miles in the North Lease Area.

[3] This estimate was made by computing the percentage of the land surface of the Basin covered by the Mine and multiplying this fraction by the estimated total number of sites.

TABLE III-5: Projected North Lease Area Site Totals Based on the South Lease Area Data

	Direct Projection	Qualified Projection
Anasazi Sites		
Ceramic Scatters	15	10
Small Structures	9	6
Large Structures	10	7
Multiple Structures	2	2
Other	9	6
TOTAL (A)	45	31
Navajo Sites		
Hogans	78	50
Campsites/Corrals	42	28
Sweathouses	44	29
Other	9	6
TOTAL (B)	173	113
TOTAL (A) & (B)	218	144

TABLE III-6: Projected Site Totals Based on SJBRUS

	Known Basin	Projected Basin	Projected North Lease Area
Paleo-Indian	29	600	less than 1
Archaic	600	12,000	7
Basketmaker II	104	2,100	1
Basketmaker III	874	17,480	10
Pueblo I	1,417	28,340	17
Pueblo II	2,747	55,000	33
Pueblo III	2,079	42,000	25
Pueblo IV & V	82	1,640	1
Unknown Anasazi	358	27,000	16
Pre-1868 Navajo	511	4,000	2
Post-1868 and Unknown Navajo	4,895	100,000	60
TOTAL			172

APPENDIX IV

THE PREDICTIVE MODEL

THE PREDICTIVE MODEL

I. Introduction

Prehistoric and historic peoples who inhabited the San Juan Basin participated in diverse subsistence and settlement systems. Hunting, gathering, agriculture, and animal husbandry were emphasized to different degrees at different times and places. However, peoples participating in systems that existed at different times and with different overall economic patterns can and do use similar locations for habitation, acquiring particular food resources, and other activities.

The McKinley Mine area is a good example of a location where the use of different subsistence strategies is likely to produce a similar overall site distribution. Environmental diversity is relatively limited in the area. The land surface slopes from about 7600 feet in the north to around 6600 feet in the south. It is dissected by washes. Valleys are filled with deep sediments and the ridges bounding the valleys have very thin soils. Valley bottoms are most commonly covered by a sage community and the uplands by juniper-pinyon.

Peoples who used the area for hunting would have exploited resources found throughout the area. Consequently, isolated artifacts might be found anywhere. However, the location of sites should be patterned. Temporary camps should be on promontories overlooking the valleys, places from which the movement of game could be observed. More permanent camps would have been located near such water sources as springs and streams.

Agricultural resources that would have been the subject of gathering are found in all of the plant communities in the Mine area. Thus, isolated artifacts reflecting these resource acquisition activities might be found anywhere. Given the ubiquitous distribution of such useable resources, water is most likely to have been the primary determinant of settlement location. Camps sites would, therefore, have been located adjacent to upland springs or in open-air or rockshelter locations in the valley bottoms where permanent sources of water were most likely to have been found. Given that the resources of the juniper-pinyon woodland would have been available within a few hundred yards of the valley bottoms, long-term camps in the upland areas would have been unnecessary.

For agricultural peoples, high quality and well-watered soils would have been the most critical resource. Prehistoric peoples generally avoided placing living sites on the best soils, locating such sites adjacent to them. Thus, one would expect to find these sites at the margins of the valley bottoms. In the Southwest generally, the growing season becomes shorter as altitude increases and is ultimately too short for successful crop production. Thus, one would anticipate heavier utilization of lower elevation areas.

Navajo groups engaged in stock raising would have been concerned with three key resources: good grazing, water, and protected areas for holding stock. These concerns should have caused Navajo sites to be concentrated in the valley bottoms and sheltered upland areas with good pastures and springs.

B. Major attention was then focused on four variables: vegetation, elevation, soils, and surficial geology. A study was done to evaluate the degree of autocorrelation of these variables. No significant degree of autocorrelation was found.

1. Vegetation

Vegetation was ultimately rejected as a predictive variable because of the nature of the prediction that could be obtained. Most sites occur in either juniper-pinyon woodland or in sagebrush-dominated areas. However, most of the land surface in the area is covered by one or the other of these communities. Thus, the prediction is a trivial one.

2. Elevation

A strong pattern of association was discovered between Anasazi sites and elevation. The probability is less than one in one thousand that the association occurs by chance (see Table IV-1 and Figure IV-1). Approximately 31 percent of the land surface in the South Lease Area occurs above 7000 feet, but only 5 percent of the Anasazi sites occur above this elevation. A similar statement cannot be made concerning Navajo sites. Navajo sites clearly occur at higher elevations, although they do not occur at the very highest elevations in the South Lease Area (see Figure IV-2). However, the surface area covered by these highest elevations is too small to permit a statistical evaluation of the relationship.

TABLE IV-1: Anasazi Sites By Elevation

CHI - SQUARE = 19.427

PROBABILITY LESS THAN 1 IN 1000

	Predicted	Observed
Low Altitude	43	59
High Altitude	19	3

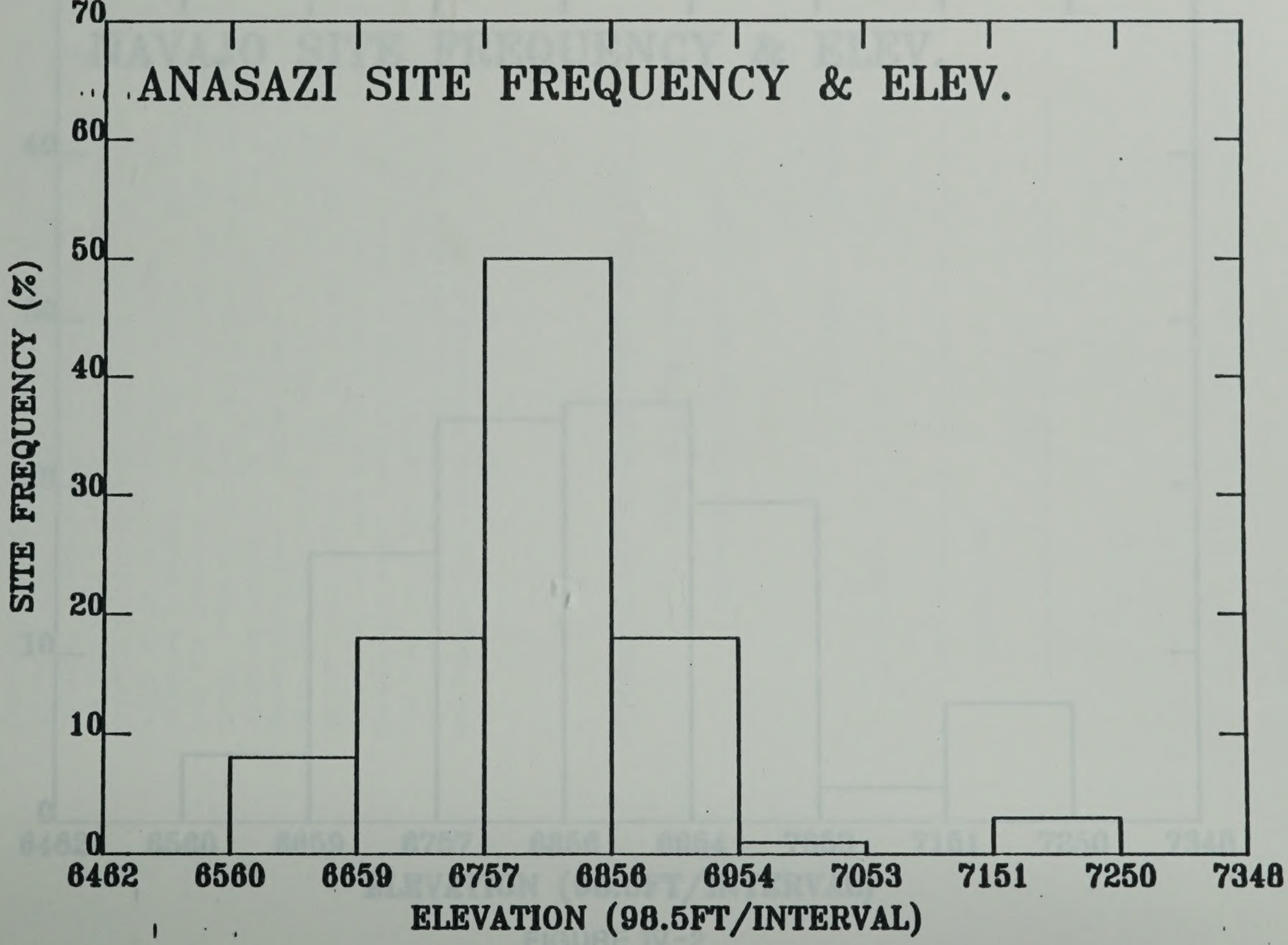

ANASAZI SITE FREQUENCY & ELEV.
SITE FREQUENCY (%)
70
60
50
40
30
20
10
0
6462
6560
6659
6757
6856
6954
7053
7151
7250
7348
ELEVATION (98.5FT/INTERVAL)

FIGURE IV-1

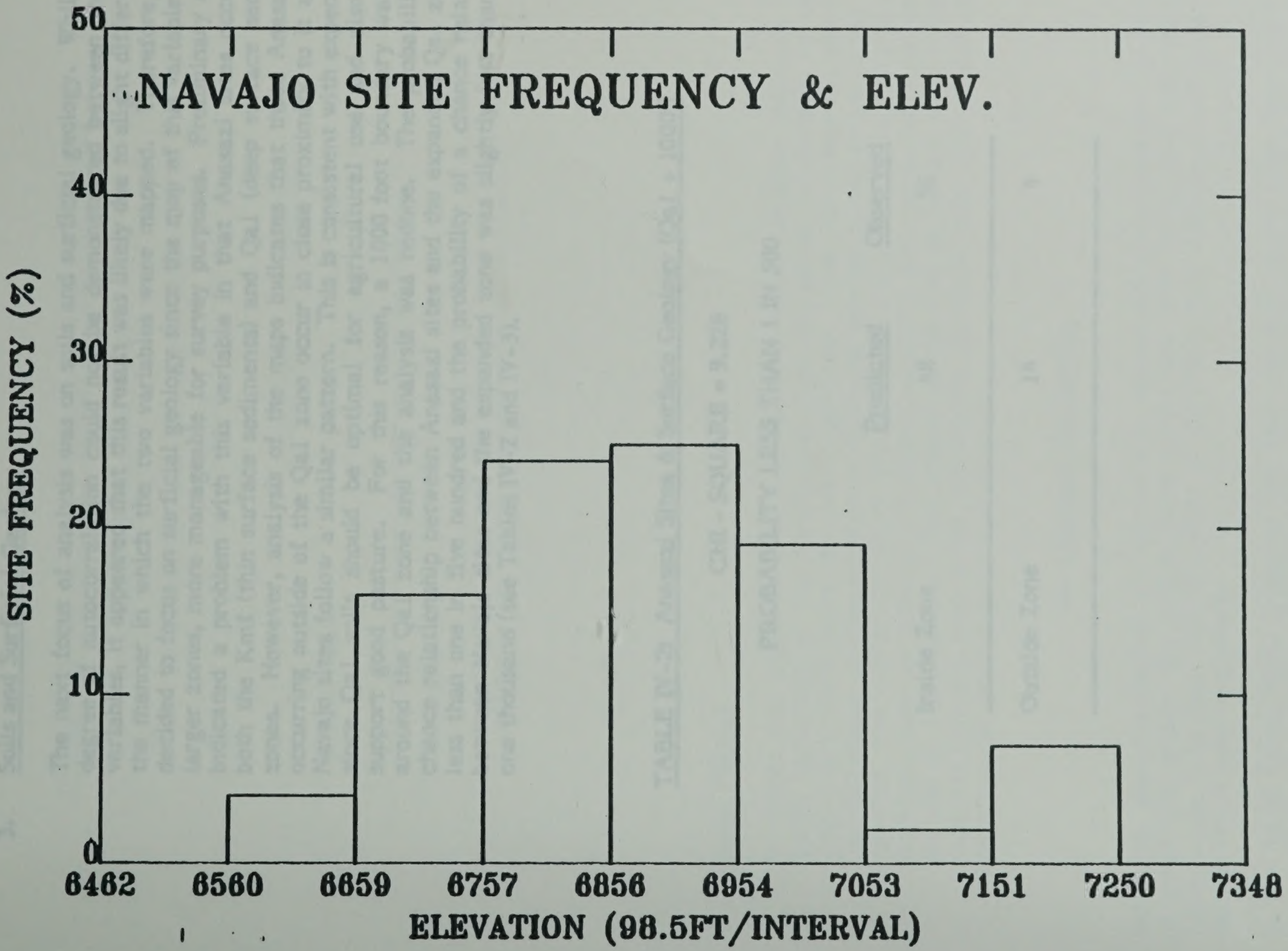

NAVAJO SITE FREQUENCY & ELEV.
SITE FREQUENCY (%)
0
10
20
30
40
50
6462
6560
6659
6757
6856
6954
7053
7151
7250
7348
ELEVATION (98.5FT/INTERVAL)

FIGURE IV-2

3. Soils and Surficial Geology

The next focus of analysis was on soils and surficial geology. While a high degree of autocorrelation could not be demonstrated between these two variables, it appeared that this result was likely due to slight differences in the manner in which the two variables were mapped. Therefore, it was decided to focus on surficial geology since the map of this variable defines larger zones, more manageable for survey purposes. Preliminary analyses indicated a problem with this variable in that Anasazi sites occurred in both the Kmf (thin surface sediments) and Qal (deep surface sediments) zones. However, analysis of the maps indicates that those Anasazi sites occurring outside of the Qal zone occur in close proximity to it and that Navajo sites follow a similar pattern. This is consistent with expectations, since Qal soils should be optimal for agricultural use and also should support good pasture. For this reason, a 1000 foot boundary was drawn around the Qal zone and the analysis was redone. The probability of a chance relationship between Anasazi sites and the expanded Qal zone was less than one in five hundred and the probability of a chance relationship between Navajo sites and the expanded zone was slightly less than one in one thousand (see Tables IV-2 and IV-3).

TABLE IV-2: Anasazi Sites & Surface Geology (Qal + 1000')

CHI - SQUARE = 9.226

PROBABILITY LESS THAN 1 IN 500

	Predicted	Observed
Inside Zone	48	58
Outside Zone	14	4

TABLE IV-3: Navajo Sites & Surface Geology (Qal + 1000')

CHI - SQUARE = 10.105

PROBABILITY LESS THAN 1 IN 1000

	Predicted	Observed
Inside Zone	190	210
Outside Zone	50	30

C. Social Factors

An effort was made to determine whether social variables reflected in the spatial patterning of site distributions (i.e., the spatial relationship of sites to each other) would serve as a useful predictor. This effort was not successful. The distribution of Anasazi sites is clustered relative to the entire survey area. However, this clustering occurs within the elevation zone below 7000 feet and, therefore, does not enhance the predictive ability that can be achieved through the use of this variable. The spatial distribution of Navajo sites within the expanded Qal soil zone is not statistically different from random and cannot, therefore, be used for predictive purposes.

III. Checking the Results

Statistical analyses confirm the existence of associations and tendencies. In the case of predictive models, the critical issue is how well they work. For this reason, the South Lease Area data were examined to determine how well the model would have worked had it been used there.

In the South Lease Area, if survey had been confined to the lands below 7000 feet (about 69 percent of the area), 96 percent of the Anasazi sites and 74 percent of the Navajo sites would have been identified.

If survey in the South Lease Area had been confined to the Qal soil zone plus 1000 feet (approximately 71 percent of the land surface), 94 percent of the Anasazi sites and 88 percent of the Navajo sites would have been identified.

Had the models been used together, all of the Anasazi sites and 94 percent of the Navajo sites would have been located.

IV. Additional Evaluation

In addition to the data from the South Lease Area, other available information confirms the utility of the model for planning purposes:

A. It is consistent with the predictions that one would make on the basis of the subsistence strategies used by the peoples who lived in the area. (See Appendix II - Research Questions.)

B. In general, the 7000 foot elevation boundary is the upper limit for high densities of sites in the Southwest. For example, at a conference held two years ago to evaluate "high altitude adaptations in the Southwest," the 7500 foot line was initially used as the lower limit of the high altitude zone. For the entire state of Arizona there were only a few dozen known sites above this elevation. When the boundary was dropped to 7000 feet, there were still less than 200 sites identified for the entire state. While high altitude sites are somewhat more abundant in New Mexico than in Arizona, they have been found to occur in large quantities only in restricted areas and in locations outside the vicinity of the McKinley Mine.

C. The SJBRUS projection of likely site densities based on groundcover types (NPS 1980) indicates a situation generally similar to that predicted by the model. The McKinley Mine area lies at the northern edge of an intermediate vegetation density zone with more dense "fingers" running along major drainages into the North Lease Area.

D. The files of the Laboratory of Anthropology of the Museum of New Mexico were inspected to determine if there were known sites to the east, west and north of the North Lease Area. Records were examined for lands within five and then ten miles on surfaces above 7000 feet and in deeply sedimented valleys. Only a few such sites were found and their type and distribution were consistent with the model.

E. A surface inspection was made of a portion of the North Lease Area in order to determine whether "on the ground" factors would inhibit implementation of the proposed survey design. While walking through the area, four sweatlodges, five corrals, two petroglyph sites, one hogan, one rock cairn and a few isolated artifacts were found. The majority of these were on or immediately adjacent to Qal soils. They were also at locations that would almost certainly be selected for Reconnaisance Survey (see Appendix V -Survey Design). The exceptions, two corrals, a sweat lodge, and an isolated artifact, were within the expanded Qal soil zone.

F. Data recovered during survey of the Red Lake and Black Creek areas (Fehr et al. 1982) were examined. The Red Lake area is approximately 15 miles north of the North Lease Area and the Black Creek unit is approximately 20 miles to the southwest. The relevance of these surveys to the predictive model is questionable since Warner (1982) has noted the presence of high quality soils (pp. 12-13) and permanent water (pp. 13-15) at high elevations in both areas. However, taken at face value, the survey data suggest that sites might occur up to 7100 feet, a circumstance that will be verified through the sample survey.

In summary, existing evidence confirms the validity of the model. Further testing of the model's validity is best accomplished through evaluation of survey results.

APPENDIX V

SURVEY SHEETS

APPENDIX V

SURVEY DESIGN

SURVEY DESIGN

Based on the predictive model, portions of the North Lease Area requiring different types of survey treatment have been identified. The manner in which the survey is to be done and the manner in which subsequent decisions relating to the scope and intensity of survey modifications are described below. The various land areas are shown on Map 3.

I. Inventory Survey Zone

A. An "inventory" survey (100 percent coverage) will be performed of all land surfaces at elevation 7000 feet or below (Zone I). The survey will be accomplished by three-person crews walking 15 yards from one another. All interpretable loci with features and all loci where artifactual materials are clustered within a defineable area are to be recorded as sites. Site locations will be recorded on 1":400' maps and air photos supplied by P&M. Laboratory of Anthropology, Museum of New Mexico, site forms will be used to record each site. Isolated artifacts are to be recorded as such. Should isolated artifacts occur over a sufficiently broad area that a low density artifact scatter can be defined, a site form will be completed for the scatter. When any survey crew completes one-half day's work without recording a site, records of the environmental setting in which work was done shall be made on the form provided by the IAC (independent archeological consultant). This description should be sufficiently detailed that the environment of areas in which sites were not found can be compared with areas in which sites were found. The boundaries of each pass through the area will be marked with biodegradable flagging.

B. The IAC will provide additional site forms that will require recordation of additional detailed data to be used in the evaluation of the predictive model, and will provide for preliminary site evaluations.

II. Sample Survey Zones

The purposes of survey in the areas to be sampled are (1) to evaluate the effectiveness of the predictive model, and (2), to more precisely estimate the numbers of sites of different types which exist within the North Lease Area.

A. Qal Soil + 1000' Zone:

In the expanded Qal Soil Zone (Zone II), a total of 37 transects will be surveyed, which represents approximately 5 percent of the land surface in the zone. The spacing of transects will be approximately one per quarter section. Each transect will be ½ mile long by 50 yards wide. The transects will be distributed in a spatially stratified pattern with orientations randomized. The spatial frame for the stratification will be units of approximately 160 acres. The surveys will be conducted by two-person crews. The center line of each transect will be marked by one crew member who will walk that line. The other crew member will walk 15 yards away. On the return, one crew member will walk 6 to 8 yards

from the center line and the other 15 yards away from that individual. Site records will be kept as for the inventory survey. When no sites are found on a transect, environmental records are to be made as in the inventory survey. The transect pattern will be defined by the IAC and will ensure that the Qal portion of the zone is treated separately from the 1000' expansion portion of the zone.

B. **Low Probability Zone:**

In the area where the probability of sites is low (Zone III), a total of 15 transects will be surveyed using the same methodology as is to be used in surveying the transects in Zone II. This area is treated as a separate sampling stratum to ensure that sample units do not cross the boundary of the zone. The 15 transects will cover approximately 7 percent of the land surface of this zone.

III. Reconnaissance Survey Zone

Recognizing that predictive models and sample surveys are not designed to be maximally effective in regard to "unexpected" sites (types of sites that are not expected to occur or that occur in low frequencies in an area) or "common" sites in unexpected locations, reconnaissance survey will be conducted at designated locations where sites may be expected to occur. The totality of these locations is designated as comprising Zone IV. The designation of such locations is based on the fact that there are key settings in which sites of any type are likely to occur—at major stream confluences, near springs, on promontories, and in or adjacent to cliff faces. Zone IV locations are not shown on Map 3; all such locations will be identified by the IAC prior to survey. A reconnaissance survey will be done at these locations and the locations will be marked on both 1":400' maps and air-photos. A two-person crew will walk to or along each such location, inspecting the area lying within 100 yards of the loci as determined by surface conditions, and will record any site located in this manner. Records of each location will be maintained in the same manner as detailed for the inventory survey.

IV. Additional Site Records

Any site located while moving between transects or reconnaissance loci will be recorded in the same manner as detailed for the inventory survey.

V. Data Recovery

In addition to the site forms, data to be recovered from each site will include the following:

1. A photograph of the site and its setting.
2. A photograph of each feature at the site.

3. Any photographs that will aid in specifying the relationships between site features.

4. A "Brunton and tape" map of the major features of the site at least as detailed as the maps shown in Figures V-1 and V-2. If no features occur at the site, a rough sketch of the boundaries of the artifact distribution will be sufficient.

5. A sample collection from the site surface. The goal of the sample will be the recovery of at least 100 sherds and 100 pieces of chipped stone. Surface collections will be done in the following manner:

    a. If the area of the site is 160 square meters or less, the artifacts on the surface will be collected in their entirety, unless a very dense surface distribution allows collection of a sample.

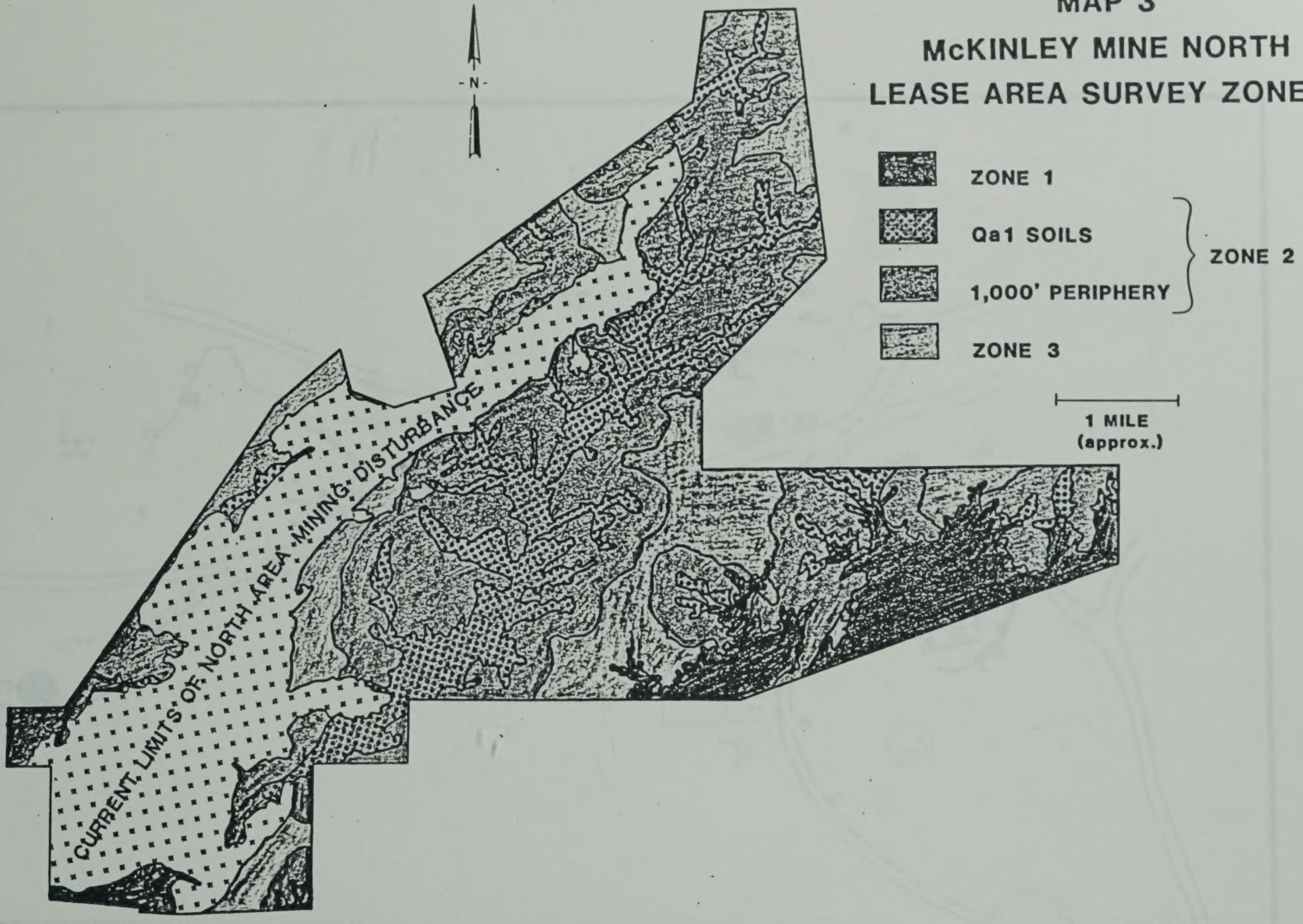
    b. If the area of the site is between 160 and 1600 square meters, north-south and east-west rope lines will be used to describe a 4-meter by 4-meter grid over the site and a random sample of ten units will be made. If artifacts collected in this manner are below the 100-artifact goals, additional units will be sampled.

    c. If the area of the site is over 1600 square meters, a 10 percent sample using the 4 x 4 meter grid system, as described above, will be made.

    d. Important diagnostic ceramic and lithic remains are to be collected whether or not they fall into a sample unit (unless sufficient diagnostics have been collected in the sample units).

6. The site record will also include an estimate of the depth of deposit of the site. In circumstances where depth of deposit can be established by visual inspection, e.g., protruding bedrock or midden mounds, such an estimate is acceptable. In circumstances where depth of deposit cannot be established visually, up to 10 auger or shovel test pits will be used to establish the depth. If evidence of depth from the first five tests is consistent, sampling will cease.

MAP 3
McKINLEY MINE NORTH LEASE AREA SURVEY ZONES



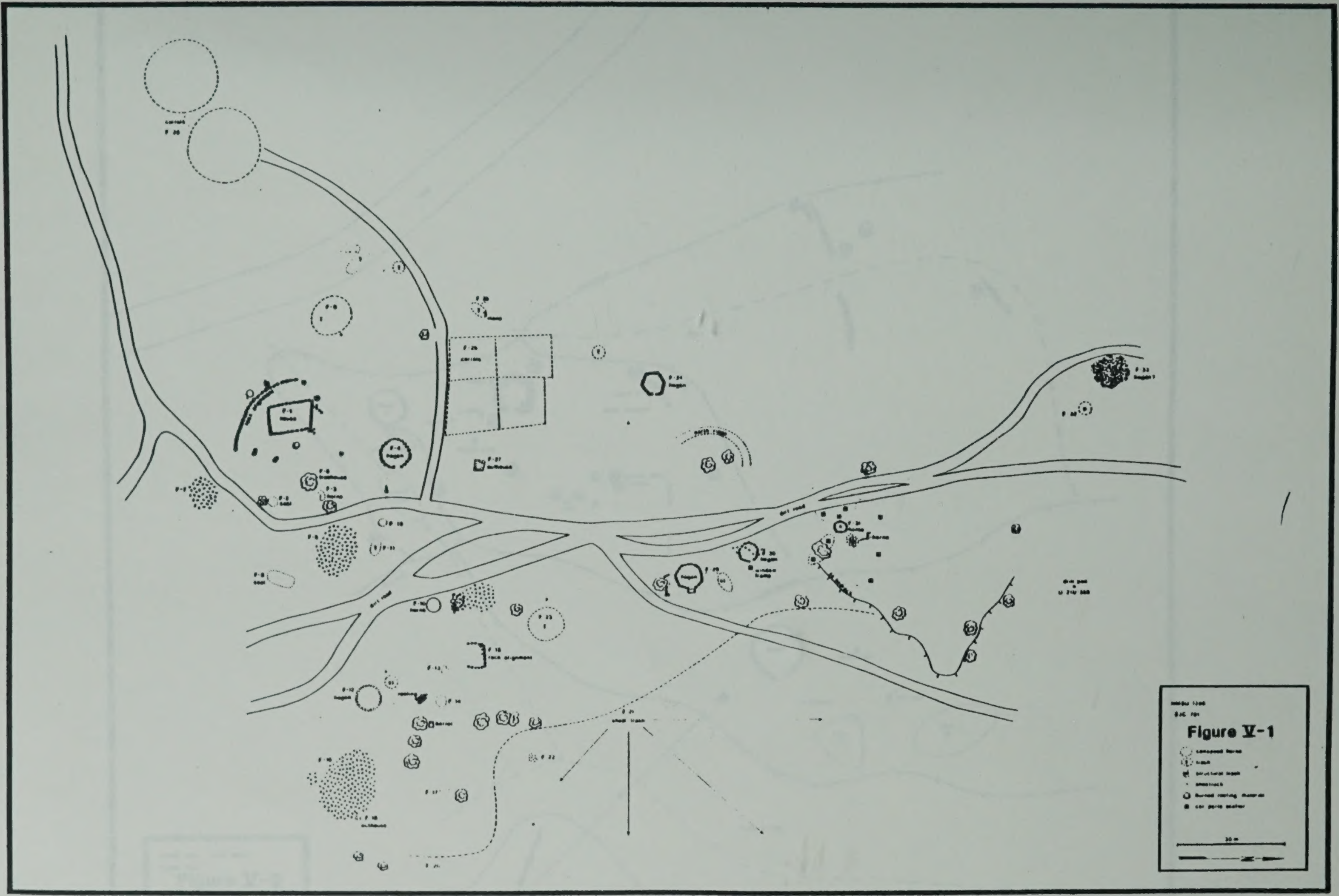


Figure V-1

trash
structural trash
burned roofing material
car parts scatter
30 m
dirt road
dirt road

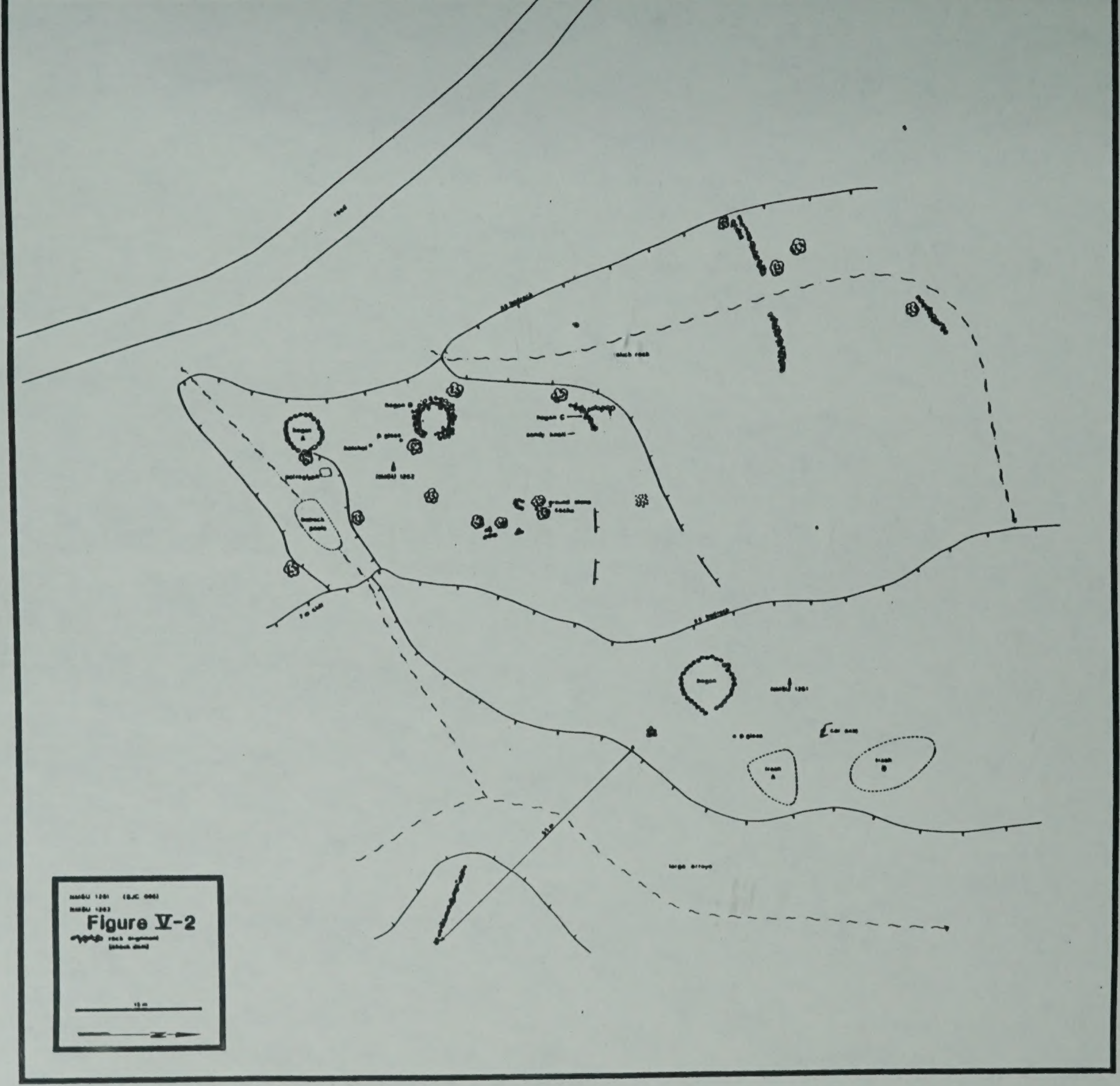

road
black rock
hogan B
hogan C
sandy knoll
hogan A
2 glass
hatchet
petroglyph
NMSU 1262
bedrock pools
ground stone tools
7 m cliff
hogan
NMSU 1261
car axle
trash A
trash B
33 m
large arroyo
NMSU 1261 (SJC 006)
NMSU 1262
rock alignment (check dam)
15 m

Figure V-2